The effectiveness of a classroom-wide word study programme to enhance the spelling skills of children with dyslexia

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Abstract

Remediation of skills deficient in students with dyslexia typically occurs via withdrawal interventions focusing on phonological awareness and letter-sound knowledge. While one-on-one interventions are widely used, little attention has been paid to the alternative teaching approach of integrating multiple linguistic component interventions within the classroom. Accordingly, this study aims to examine the effectiveness of using word study within the classroom on the spelling skills of students with dyslexia. The study was divided into two parts: 1) examining the efficacy of incorporating a small group multiple linguistic intervention within the classroom on the spelling skills of 9-year-old students with dyslexia, and if there were similar effects for reading abilities; and 2) analysing the effects of word study instruction at the whole group level on student spelling. Two case study students (both 9-years of age) with dyslexia underwent small group multiple linguistic intervention, and were monitored for 8 weeks (3 days/week; 20 minutes/session) using baseline, intervention and post-intervention probes. Whole group word study instruction was enacted in a Year 4/5 classroom for 8 weeks (1 day/week; 1 hour/session), and the spelling performance of the 9-year-old students (i.e., n = 7) were compared to same age students from a control classroom (i.e., n = 7) in pre-post assessments. Both small group intervention case study students demonstrated significant improvements in spelling, yet minimal improvement was seen for reading. Whole group comparisons indicated no significant improvement. The findings for this study have implications for: a) research on effective interventions for older children with dyslexia, and b) the practical use of spelling interventions that are designed to co-exist within classroom instruction.

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Glossary

Dyslexia: a developmental disability in which a person displays a linguistic deficit (i.e., related to processing speech; e.g., phonological awareness) resulting in poor reading and spelling skills that are not attributable to: other cognitive or physical impairments; lack of adequate instruction or schooling; emotional and/or social disabilities; or socioeconomic status

Phonological Awareness: the ability to break down words based upon their sounds

Orthographic Knowledge: the knowledge of the relationship between letters and sounds including patterns within words

Morphological Awareness: the awareness of units of meaning within words (e.g., *-ed* in *spilled*)

Phonological Deficit: the inability to or difficulty with processing sounds within words

Multiple linguistic components: the contributing factors to linguistic abilities (i.e., knowledge of language) including: phonological awareness, orthographic knowledge, morphological awareness, and semantic and syntactic knowledge

Word Study: an approach to teaching spelling that incorporates a variety of literacy concepts (i.e., multiple linguistic components as well as word origin)

1. Introduction

Dyslexia has caused controversy amongst researchers for over 100 years. While it is associated with a number of traits, the exact cause is yet to be determined. The predominant view of the underlying deficit in this disability centres on the phonological theory (Gough & Tunmer, 1986; Snowling, 1996, 1998, 2001; Stanovich, 1988; Tunmer & Greaney, 2010). This theory supports the notion that dyslexia is a phonological deficit resulting in difficulties in processing sounds within words, leading to problems with using speech-sound information in the reading and spelling process. This lack of phonological processing in the early stages of reading and spelling affects the development of key skill sets for linguistic and literacy acquisition, such as orthographic knowledge and morphological awareness (Bourassa & Treiman, 2001; Siegel, 2008; Torgesen, Wagner, & Rashotte, 1994). Orthographic knowledge contributes to memory of patterns in words and solidifies connections between letters and sounds for beginning readers and spellers. Conversely, morphological awareness aids the understanding of the meaning of elements within words (e.g., *-ing* in *running*). Both skill sets are dependent upon an awareness of sounds in words, thus a deficit that limits this appreciation (i.e., the phonological deficit) generates complications with reading and spelling development (Morais, Mousty, & Kolinsky, 1998). Research reveals some children with dyslexia acquire minimal phoneme and phonological awareness abilities as they grow older (Casalis, Colé, & Sopo, 2004), however reading and spelling difficulties persist, with skills correlating to those of young readers and spellers (Cassar, Treiman, Moats, Pollo, & Kessler, 2005).

Consistent with the phonological approach to dyslexia, intensive phonological awareness interventions (particularly when combined with letter-sound knowledge) have

proven an effective means of promoting early literacy development for children with dyslexia (Gillon & Dodd, 1998; Hatcher, Hulme, & Ellis, 1994; Lovett, *et al*., 1994; Torgesen, *et al*., 2001; Vellutino, Scanlon, Zhang, & Schatschneider, 2008). However, spelling and reading skills of older students with dyslexia, typically respond better to interventions that integrate multiple linguistic components (e.g., orthographic knowledge and morphological awareness) (Berninger, *et al*., 2003; Bourassa & Treiman, 2001; Lovett, Lacerenza, Borden, *et al*., 2000; Moats, 1995; Torgesen, 2006). As children develop moderate phonological awareness abilities, their deficits in other linguistic and literacy areas become more prevalent (i.e., difficulties with orthographic and morphological components). Due to the interdependent relationship between phonological, orthographic and morphological abilities (Berninger, Abbott, Nagy, & Carlisle, 2010; Roman, Kirby, Parrila, Wade-Woolley, & Deacon, 2009), multiple linguistic intervention specifically targets students' spelling needs whilst scaffolding upon previous knowledge (Masterson & Apel, 2007). One-on-one and small group interventions that occur outside of the classroom (i.e., withdrawal) are effective in remediating spelling and reading difficulties for students with dyslexia (e.g., Abbott & Berninger, 1999; Arnbak & Elbro, 2000; Berninger, *et al*., 2008; Casalis, *et al*., 2004; Elbro & Arnbak, 1996; Lovett & Steinbach, 1997). However, limited research exists involving the integration of these interventions into regular classroom learning (Kirk & Gillon, 2009). Children with dyslexia need ongoing support to keep pace with their peers (Torgesen, 2006; Vellutino, *et al*., 2008), therefore providing classroom intervention enables continuous learning for these students (Ehri, 1989). One method of enacting this is through word study.

Word study is an in-depth approach to teaching spelling that encourages children to explore patterns and structures of words, examining their phonological, orthographic and morphological components. This multiple linguistic method of spelling instruction includes learning word origins to assist with understanding specific spellings in the English language (e.g., *summer* originated from Anglo Saxon, and words that end in *-que* (*boutique*) are French in origin) (Moats, 2009a). Word study research at the small group level usually entails direct instruction which specifically targets the spelling difficulties of specific students (both reading and non-reading disabled) (Williams, 2009). Whole group word study instruction aims to promote inquiry-based learning of words, allowing students and their peers to investigate patterns, structures and origins together (Snowball & Bolton, 1999). A limited number of studies have examined whole group word study (e.g., Harris, Schumaker, & Deshler, 2011; Henry, 1987, 1988). Despite this, positive effects have been noted for older students, including students with learning disabilities (Henry, Calfee, & Lasalle, 1989). More research is required so as to verify this data and how it relates to students with dyslexia.

The current study aims to investigate the effectiveness of a word study intervention programme in promoting spelling development of 9-year-old students with dyslexia. More specifically the study endeavours to discover: the effects of integrating multiple linguistic spelling interventions for students with dyslexia into classroom instruction so as to improve students' spelling skills, and if similar improvement is seen in reading abilities; as well as the efficacy of a word origin and multiple linguistic word study programme initiated in a mixed inquiry-based/direct instructional setting at the whole class level. Outcomes of this study will inform educators and researchers if word study intervention programme can be effectively

integrated within the classroom setting, and its impact on spelling abilities of children with dyslexia.

2. Literature Review

This literature review delves into the theoretical and practical perspectives of dyslexia and word study. It is presented using the following four components:

1) What is Dyslexia: An examination of the multiple perspectives and traits of dyslexia.
2) Literacy Development and Dyslexia: A review of linguistic elements involved with spelling and how these are exhibited in children with dyslexia.
3) Intervention Training and Dyslexia: A discussion of the impact of interventions for children with dyslexia and their role in remediation.
4) Taking it to the Classroom – Word Study and Spelling: A theoretical view of spelling and effective spelling interventions, as well as a discussion of the components to word study and how it translates into the classroom.

2.1 *What is Dyslexia?*

Dyslexia was first described as word-blindness over 100 years ago, meaning the person affected could not see words correctly, yet exhibited no other physical or mental disabilities to prevent them from doing so (Rawson, 1987; Snowling, 1996). Current definitions of dyslexia recognise the disorder as a developmental disability in which a person displays a linguistic deficit (i.e., related to processing speech; e.g., phonological awareness) resulting in poor reading and spelling skills that are not attributable to: other cognitive or physical impairments; lack of adequate instruction or schooling; emotional and/or social disabilities; or socioeconomic status (Frith, 1986; Gough & Tunmer, 1986; Locke, *et al*., 1997; Lyon, Shaywitz, & Shaywitz, 2003; TKI, 2010). Over the years, research has found a number of

traits to be associated with dyslexia including: deficits in phonological awareness (i.e., the ability to break down words based upon their sounds), orthographic knowledge (i.e., the knowledge of the relationship between letters and sounds including patterns within words), morphological awareness (i.e., the awareness of meaning within words), motor control (i.e., poor fine motor skills as well as inadequate balance and coordination), auditory processing (i.e., the ability to process brief auditory information, such as sounds, rapidly and accurately), and visual processing (i.e., the ability to process visual information, such as text, accurately and rapidly); as well as having genetic associations (i.e., hereditary traits; e.g., poor phonological abilities) (Alexander, Andersen, Heilman, Voeller, & Torgesen, 1991; Berninger, *et al*., 2008; Bishop & Snowling, 2004; Bourassa & Treiman, 2001, 2003; Bourassa, Treiman, & Kessler, 2006; Carlisle, 1987; Gillon, 2004; Heath, Hogben, & Clark, 1999; Livingstone, Rosen, Drislane, & Galaburda, 1991; Nicolson & Fawcett, 1995, 1999; Ramus, Pidgeon, & Frith, 2003; Snowling, 1998; Stanovich, 1988; Stein & Walsh, 1997; Tallal, 1980; Tallal, Miller, & Fitch, 1993; White, *et al*., 2006). Of these symptoms, deficits in phonological awareness have proven to be the most reoccurring trait (Snowling, 1996). With so many associated traits, it is difficult for researchers to agree on an explanation or description of dyslexia (Ramus, Rosen, *et al*., 2003), which has lead to the establishment of various theories and perspectives in order to justify the manifestations of these symptoms (e.g., Hautus, Setchell, Waldie, & Kirk, 2003; Nicolson & Fawcett, 1995; Ramus, Pidgeon, *et al*., 2003; Snowling, 2001; Stanovich & Siegel, 1994; Stein & Walsh, 1997). Three widely discussed and prominent theories that attempt to explain these underlying symptoms of dyslexia include: the biological perspective, the cognitive approach and the phonological theory (Ramus, Rosen, *et al*., 2003).

2.1.1 The Biological Perspective

The biological perspective adheres that dyslexia is a physical biological impairment that accounts for inadequacies with visual, auditory, motor and phonological symptoms associated with the difficulty (Frith, 2001). It relates cognitive traits and abilities (e.g., visual, auditory and phonological processing, plus motor control) to biological functions (i.e., heritability of cognitive disorders) (Ramus, 2006) and describes dyslexia as a developmental disorder in which genetics and a person's environment both are equally contributing factors (Frith, 2001). While delayed motor skills are attributed to this approach (White, *et al*., 2006), more commonly associated traits include auditory, visual, cerebellar and phonological processing. Various theories have developed from the biological perspective and amalgamate these traits together to form an inclusive explanation of dyslexia (e.g., Livingstone, *et al*., 1991; Ramus, Pidgeon, *et al*., 2003; Stein & Walsh, 1997). The more lasting theories that have endeavoured to do so include: the rapid auditory processing theory, the visual theory and the magnocellular theory.

2.1.1.1 **The Rapid Auditory Processing Theory**

The rapid auditory processing theory regards dyslexia as an auditory deficit in which those affected are unable to process short or rapidly varying sounds (Ramus, Rosen, *et al*., 2003); for example the ability differentiate between tones or beats (i.e., high versus low, or fast versus slow; e.g., Tallal, 1980). The foundations of this theory derive from the relationship between auditory processing and its impact on phonological processing (i.e., the ability to use sounds to process written and oral language; Wagner & Torgesen, 1987) for people with specific language impairments (i.e., SLI) (Tallal, Allard, Miller, & Curtiss, 1997). Specific

language impairment pertains to children who indicate oral language difficulties (i.e., spoken language difficulties) despite being immersed within a language-learning environment, and that is not accredited to lower non-verbal intellectual ability, neurological damage, sensory loss, and severe physical, emotional or behavioural disorder (Gillon, 2004). Similar to dyslexia, SLI is developmental (i.e., present from childhood through adulthood) and rooted in a deficiency of phonological abilities (Bishop & Snowling, 2004). Some research suggests that SLI and dyslexia are also related through their genetic foundations and the continuums to which they correlate (e.g., Bishop & Snowling, 2004; Carroll & Snowling, 2004; Frith, 2001). These parallels have led some to associate the difficulties with auditory perception and phonological processing sometimes seen in SLI with dyslexia (Bishop & Snowling, 2004). Studies have shown, in some cases of dyslexia, poor performance on auditory and discrimination tasks to be linked with poor phonological processing (e.g., Griffiths, Hill, Bailey, & Snowling, 2003; McAnally & Stein, 1996; Ramus, Rosen, *et al*., 2003). While this offers one explanation for the inability of people with dyslexia to exhibit phonological processing skills, this auditory deficit is not found among most people with dyslexia and does not fully explain the phonological deficits that are prevalent (Griffiths, *et al*., 2003).

2.1.1.2 **The Visual Theory**

The visual theory considers dyslexia as a visual impairment, resulting in difficulties processing text (Ramus, Rosen, *et al*., 2003). Unlike the rapid auditory processing theory, this approach considers visual pathways as the root of difficulties for people with dyslexia (Livingstone, *et al*., 1991). The visual system is divided into two separate neuron pathways: the parvocellular and magnocellular. While parvocellular cells are receptive to colour and fine

details, magnocelluar cells have higher temporal sensitivity (i.e., relating to the time it takes to process an image) (Stein & Walsh, 1997). Selective disruption of the magnocellular pathway leads to difficulties with visual processing, abnormal binocular control (i.e., eye movement) and inadequate visuospatial attention (i.e., spatial perception of objects) (Ramus, Rosen, *et al*., 2003). Deficiencies in parvocellular pathways have lead to problems with colour discrepancy which some have tried to remediate using different types/colours of paper and text for people with dyslexia to read (Wilkins, 2003). Researchers in this theory believe that visual deficits are the origin of complications with reading text, thus contributing to difficulties with reading letters and words (Ramus, Rosen, *et al*., 2003). Although this theory explains difficulties with word recognition that are experienced with dyslexia, it does not fully account for other phonological processing deficits (i.e., oral discrimination of phonemes within words) (Snowling, 1996). The closest a biological theory has come to incorporating all of these traits and deficits together is the magnocelluar theory (Ramus, Rosen, *et al*., 2003).

2.1.1.3 **The Magnocellular Theory**

The magnocellular theory, which is one of the more lasting biological viewpoints, is a variation of the visual cause of dyslexia (Ramus, Rosen, *et al*., 2003). Similar to the visual theory, it centres around a deficit within the visual pathway (i.e., the magnocellular and parvocellular layers within the retina) causing difficulties with processing movement, thus founding other deficits in colour sensitivity, contrast sensitivity, temporal resolution and acuity (Livingstone, *et al*., 1991). Alternatively, the magnocellular theory also includes deficiencies to the medial geniculate nucleus of the thalamus (i.e., the area of the brain under the cerebellar cortex), which is responsible for movement, auditory processing and other neurological

functions (Tallal, *et al*., 1993). The core strength of the magnocellular theory is that it links a variety of modalities together (i.e., auditory, visual and phonological) in order to make it a more all-inclusive theory (Ramus, Rosen, *et al*., 2003). However, there are very few accounts of people with magnocellular deficits (i.e., discrepancies with the medial geniculate nucleus and the magnocellular pathways occurring at the same time), thus creating criticism around the ability to replicate findings of this theory (Heath, *et al*., 1999; Hill, Bailey, Griffiths, & Snowling, 1999; McArthur & Hogben, 2001; Ramus, Rosen, *et al*., 2003).

2.1.2 The Cognitive Approach

Another perspective of the root of dyslexia is the cognitive approach. This approach views dyslexia a deficit with temporal processing speed (Hautus, *et al*., 2003; Tallal, 1980). Temporal processing speed relates to a person's ability to process auditory and visual stimulants with automaticity (Nicolson & Fawcett, 1995) including: rapid naming skills, rapid visual processing, and phonological processing (Nicolson & Fawcett, 1999). Researchers from the cognitive approach have argued that temporal processing deficits provide an explanation for the difficulties associated with dyslexia (e.g., McAnally & Stein, 1996; Stein & Walsh, 1997). Stien and Walsh (1997) believe that the co-morbidity of certain traits (i.e., phonological awareness skills seen with deficits in visual processing) is likely to be from one fundamental abnormality that has various manifestations within the cognitive system. Nicoloson and Fawcett (1995) relate these difficulties and deficits to the magnocellular system, which connects it to the biological perspective. Instead of focusing on the ability to visually process cues, the automaticity of visual stimulus (i.e., text) becomes the forefront of this deficit as well its' effects on auditory processing, particularly speech (Rosen, 1999). This belief posits that

irregularities in the magnocelluar system cause difficulty for people trying to process changes in speech and language, thus leading to complications with phonological discrimination and reduced phonological skills (Tallal, *et al*., 1993).

In a multi-age based study (i.e., 6 years to adult), Hautus *et al*. (2003) examined the effects of temporal processing acuity for people with dyslexia. They found that while younger children with dyslexia (i.e., 6-year-olds) demonstrated poorer temporal acuity skills when compared to their peers this deficit was not reflected in adolescents and adults with dyslexia. Overall, conclusions of this discovery maintained that auditory deficits associated with temporal processing in children with dyslexia eventually devolve with maturation while phonological deficits stay persistent despite age (Hautus, *et al*., 2003); thus, refuting auditory processing difficulties as a developmental deficit in dyslexia (Hill, *et al*., 1999).

In each of these perspectives (i.e., biological and cognitive) phonological awareness has remained one of the most prominent deficits in people with dyslexia. While many researchers have approached these deficits through other explanations (e.g., Hautus, *et al*., 2003; Nicolson & Fawcett, 1995; Ramus, 2006; Rosen, 1999; White, *et al*., 2006) some have found these non-phonological approaches to dyslexia to be insufficient in their interpretations (Sprenger-Charolles, Colè, & Serniclaes, 2006), believing that dyslexia is primarily a phonological difficulty and should to be acknowledged as thus.

2.1.3 The Phonological Theory

The phonological theory is one of the more widely accepted and contemporary perspectives of dyslexia (Tunmer & Greaney, 2010), as well as the perspective that is used to approach dyslexia within this study. This theory proposes that phonological deficits are casual

to the literacy difficulties experienced by people with dyslexia (Frith, 1986). In the phonological theory dyslexia is commonly referred to as a reading disability (e.g., Goodwin & Ahn, 2010; Kirk & Gillon, 2009; Stanovich, 1991) and people who fit this dyslexia profile exhibit moderate to high verbal and oral language skills but perform poorly on reading and spelling tasks, in particular the phonological adeptness used for these skills (Tunmer & Chapman, 2006). As there are a number of learning disabilities associated with reading and linguistic awareness (i.e., awareness of phonological, orthographic and morphological components), high-ranking listening comprehension along with poor decoding distinguishes people with dyslexia from those with mixed reading difficulties (i.e., poor decoding and comprehension) (Gough & Tunmer, 1986). The phonological theory differs from other theories in that it focuses on the discrepancy between oral language comprehension versus phonological skills instead of discrepancies between deficits manifested and IQ (Ramus, Rosen, *et al*., 2003). IQ is not central to the phonological theory because measuring reading skills through intelligence is not a successful determinant of reading ability (Stanovich, 1991; Stanovich & Siegel, 1994).

The phonological theory also emphasises the hereditary nature of dyslexia. Research within the phonological theory has noted a biological link with dyslexia in that phonological deficits can be traced through family history (e.g., Pennington & Lefly, 2001; Pennington, *et al*., 1986; Puolakanaho, *et al*., 2007; Vellutino, *et al*., 2008). This link further establishes the impact of phonological awareness as a core deficit in dyslexia (Snowling, 2001).

This phonological core deficit (Snowling, 1998; Stanovich, 1988) results in a weak phonological foundation which effects the development of other key literacy skills such as

orthographic knowledge and morphological awareness (see Section 2.3) (Cassar, *et al*., 2005). This leads to poor word recognition, spelling and decoding abilities (Lyon, *et al*., 2003). Snowling (2001) argued that phonological deficits result in inabilities to process language and literacy skills instead of auditory and visual temporal processing deficits which are not always prevalent in people with dyslexia (Hill, *et al*., 1999). Thus, as phonological skills are a key foundation for beginning reading and spelling (Bradley & Bryant, 1983; Bryant & Bradley, 1980), the phonological deficit prevents this development effecting later reading and spelling abilities.

Although children with dyslexia develop a limited amount of phonological awareness, their reading and spelling skills remain developmentally lower than their peers (Moats, 1983); these difficulties continue to persist throughout adulthood (Lovett, Lacerenza, Borden, *et al*., 2000). While phonologically based interventions have proven to be effective remediation and identification tools for children with dyslexia, more beneficial interventions have included multiple linguistic elements such as orthographic knowledge and/or morphological awareness (Casalis, *et al*., 2004; Vellutino, *et al*., 2008). Before embarking on interventions for dyslexia it is essential to understand the role of literacy development and how it is exhibited in children with dyslexia.

2.2 *Literacy Development and Dyslexia*

As dyslexia is primarily associated with difficulties in word recognition and spelling (Tunmer & Greaney, 2010), having an understanding of the skill sets required for literacy development is critical in order to better understand how the phonological deficit of dyslexia

effects abilities to read and spell competently (Snowling, 1998). This section describes the key skill sets required for literacy development, in particular spelling development (i.e., phonological awareness, orthographic knowledge and morphological awareness; Roman, *et al*., 2009), and how these relate to children with dyslexia.

2.2.1 Phonological Awareness

Phonological awareness is an individual's explicit awareness of a word's phonological structure (Torgesen, *et al*., 1994). The ability to separate words is categorised into three co-dependent levels: syllable awareness, onset-rhyme structure, and phoneme awareness (Gillon, 2004).

Syllable awareness requires the ability to orally divide words into syllables (Gillon, 2004). For example the word *hunter* is separated into two parts: *hun – ter*. Syllable division requires each syllable within a word to contain a vowel (e.g., *baby* is separated into two syllables, *ba – by*, with the vowels /e/ and /i/) (Moats, 1995) as well as succeeds stressed patterns within words employing as many consonants as possible at the beginning of the stressed syllable (Gillon, 2004; Treiman, 1993). A stressed syllable is one that is emphasised more than others in a word (Moats, 2000). For example *patrol* is divided into *pa – trol* as the second syllable is stressed over the first requiring at least two consonants to separate it from the first syllable.

Knowledge of syllable awareness allows beginning readers and spellers to verbally and physically (i.e., tapping, clapping, and chin-movement) break down words as well as identify where vowels are located within words (Gillon, 2004; Moats, 2000; L. Moats, personal communication, April 2010). When it is utilised with spelling, syllable awareness aids with the

assistance of legal groupings of consonants at the beginning or end of words. For example the word *only* is separated into *on – ly* because 'nl' is not a legal spelling at the beginning or end of words in English. While syllable awareness assists with beginning reading and spelling abilities it not a strong predictor of literacy skills. Further, phonological awareness interventions focussed at the syllable level have not proven effective (Gillon, 2000; Good, 2009; Nancollis, Lawrie, & Dodd, 2005).

Onset and rime refers to the grouping of phonemes at the beginning (i.e., what comes before the vowel) and end (i.e., the vowel and what comes after), respectively, of syllables and words (Moats, 2000). This two-part division consist of units that are larger than phonemes but smaller than syllables (Goswami & Bryant, 1990). For example in the word *cream*, *cr-* is the onset and *-eam* is the rime. Knowledge of onset-rime awareness indicates an ability to rhyme words since rhyming involves the awareness that some words share a specific ending (i.e., rime) which is different from the beginning (i.e., onset) (Gillon, 2004): *bell* and *tell* both end in the rime *-ell*, however the onset of both words (i.e., /b/, /t/) differ. Therefore, children who demonstrate an understanding that two words rhyme (i.e., share a similar sound) indicate some level of phonological awareness, even if they are unable to identify the shared sound (Goswami & Bryant, 1990).

Rhyme significantly impacts not only beginning reading but also spelling (Bryant, Maclean, & Bradley, 1990). When applied to spelling, knowledge that words have a shared sound that is two or more phonemes allows beginning spellers to develop the notion of shared sequences within words (e.g., *c<u>at</u>*, *h<u>at</u>*, *b<u>at</u>*), thus furthering the connections between sounds and letters (Bryant, *et al*., 1990; Goswami & Bryant, 1990). However, while rhyming is an

essential skill for phonological development, much like syllable awareness it is not an effective intervention on its' own, or when applied with syllable awareness. Thus, it has little effect on literacy acquisition for struggling readers and spellers (Nancollis, *et al*., 2005).

Finally, phoneme awareness involves the ability to separate words into individual sounds or phonemes (Gillon, 2004). Phonemes are the smallest units of speech that affect the meaning of words (Moats, 1995). For example there are three phonemes in the word *feet* (/f/, /i/, /t/), however if you substitute the /t/ for /l/ the word becomes *feel* and the meaning changes (Gillon, 2004). Phonemes within spoken words are not apparent as they are blended together into syllables affecting the way they sound (Gillon, 2004). As decoding speech sounds is a key part of learning to read and spell (Ehri & McCormick, 1998) developing the ability to decode phonemes helps the perception of phonemes within speech (Liberman, Cooper, Shankweiler, & Studdert-Kennedy, 1967). This later transfers to literacy development when children acquire other skill sets (e.g., knowledge of alphabetic script) (Schuele & Boudreau, 2008), and performs a crucial role with decoding and blending words for reading and spelling (Gillon, 2004).

While all of these skills are interrelated, in that they all involve the awareness of separating words into smaller parts (Gillon, 2004), phoneme awareness is a better predictor of reading and spelling abilities for younger children (Anthony & Lonigan, 2004; Ball & Blachman, 1991). This is because the various tasks involved in phoneme awareness (i.e., phoneme detection, phoneme deletion, phoneme manipulation, phoneme blending and phoneme segmentation) range in complexity and difficulty (Schuele & Boudreau, 2008), and provide fundamental precursor skills required for processing grapheme-phoneme (i.e., letter-

sound) correspondence in words (Ehri & McCormick, 1998). For example phoneme detection (i.e., identifying phonemes within words) is less difficult for children, whereas phoneme segmentation and deletion are more demanding since they require additional processing skills (Gillon, 2004). The ability to manipulate and blend phonemes is critical for word recognition and spelling (Griffith & Olson, 1992). A lack of this skill contributes to the phonological deficit seen in children with dyslexia (Caravolas, Volìn, & Hulme, 2005).

Caravolas *et al.* (2005) demonstrated the impact of phoneme awareness on reading not only across languages (i.e., Czech and English) but also with Grades 3-7 (Years 4-8) children with dyslexia. There were no discrepancies between languages for children with dyslexia in demonstrating low phonemic abilities. In fact, children with dyslexia consistently performed worse than their peers on phoneme awareness tasks; their skills corresponding to abilities of non-dyslexic children two years younger (Caravolas, *et al*., 2005). A lack of phonemic awareness in students with dyslexia has been noted in other studies (e.g., Marcel, 1980; Morais, *et al*., 1998; Torgesen, 2006; Torgesen, *et al*., 1994), further demonstrating how a deficit with phonological awareness can severely affect reading and spelling abilities (Bruck, 1998; Snowling, 1998).

Phonological awareness has proven to be a crucial link between oral and written language (Gillon, 2005; Stackhouse & Wells, 1997). For beginning readers and writers phonological awareness plays a key role for reading and writing development (Hogan, Catts, & Little, 2005) by allowing children to decode and manipulate sounds, as well as break down words into separate parts (Gillon, 2004). Unlike their phonologically deficient counterparts, children who exhibit strong phonological awareness are adept with reading and spelling

concepts (Torgesen, *et al*., 1994). This is demonstrated in Gillon and Dodd (1998) where they followed the progress of an 8-year-old boy with dyslexia over a 4-year duration. After a 2-year observation/assessment period, a multiple linguistic intervention involving a mix of phonological awareness training with linking speech to print followed by semantic/syntactic training of vocabulary was initiated. Intervention occurred over 24 weeks, 1 hour/week, with the first 12 hours focused on phonological awareness skills and the second on the semantic/syntactic training. The case study student continued assessments over the next 2-year period to determine longitudinal effects. Results prior to intervention showed that the case study child demonstrated difficulties with phonological awareness, word recognition and particularly spelling. Word recognition and spelling both improved post-intervention, demonstrating the positive effects of phonological awareness intervention plus multi-linguistic components (Gillon, 2000; Gillon & Dodd, 1997). While semantic/syntactic intervention did not explicitly improve reading and spelling, semantic and syntactic awareness improved over time, thus contributing to positive effects in comprehension. Most improvement was seen post-phonological awareness intervention demonstrating the importance of phonological awareness skills combined with orthographic components on the reading and spelling of students with dyslexia (Gillon & Dodd, 1998; Ziegler, *et al*., 2010). Overall, longitudinal results demonstrated an ability to adopt strategies and skills in order to assist with reading and spelling. While difficulties in these areas persisted over time the intervention served to decrease their severity (Gillon & Dodd, 1998; Torgesen, 2006).

Phonological awareness is a key predictor to word recognition (Verhagen, Aarnoutse, & van Leeuwe, 2008). Children who struggle with phonological awareness exhibit future

difficulties with reading and spelling (Puolakanaho, *et al*., 2007). Interventions based on phonological awareness effectively improve and remediate these skills, leading to better reading and spelling abilities (e.g., Gillon, 2000, 2002; Gillon & Dodd, 1997; Hatcher, Hulme, & Snowling, 2004; Kirk & Gillon, 2007; Lyster, 2002; McNeill, Gillon, & Dodd, 2009; Moriarty & Gillon, 2006; Schneider, Roth, & Ennemoser, 2000; Schuele & Boudreau, 2008; Troia, 1999; Tunmer, 2008), particularly for children with dyslexia (see Section 2.3). However, the most effective of these interventions have been combined with other linguistic elements such as training in letter knowledge and word reading, and explicit instruction with linking phonological awareness to orthographic knowledge (Bishop & Snowling, 2004).

2.2.2 Orthographic Knowledge

Orthographic knowledge is a crucial component of the development of literacy skills and understanding conventions within spelling (Apel, 2011; Berninger, *et al*., 2006; Berninger, *et al*., 2010; Masterson & Apel, 2007; Roman, *et al*., 2009). It is composed of two elements: the storage of mental graphemic representations (MGR; also referred to as mental orthographic images) and orthographic pattern knowledge (Masterson & Apel, 2010). MGR refers to the storage of mental representations of words and word parts (Apel, 2011) and is developed through exposure to and development of strong grapheme-phoneme connections in words (Ehri, 2005). Representation of words can be either complete (i.e., accurate representation of a word; e.g., *pat*) or incomplete (i.e., an inaccurate or not legal representation of a word; e.g., *graple* instead of *grapple*) (Wolter & Apel, 2010). Complete mental representations of words allow children to access specific spellings of words within their memories to promote accurate/fluent reading and spelling skills (Apel & Masterson, 2001). Insufficient MGR's lead

to less fluent reading and spelling as the child requires more time to sound words out (Wolter & Apel, 2010).

The second component of orthographic knowledge are orthographic patterns (Apel, 2011). Pulling from an understanding of phonemes (Bourassa & Treiman, 2001), this element of orthographic knowledge encompasses the rules for translating speech into print (Masterson & Apel, 2010) including: letter-sound knowledge, indentifying various spelling patterns (e.g., 'ee', 'ea', 'ie' and 'ey'), as well as understanding the effects of vowel length on certain spelling patterns (e.g., *back* versus *bake*) (Treiman & Bourassa, 2000). Children with incomplete MGR pull from their knowledge of orthographic patterns in order to assist spelling unknown words (Masterson & Apel, 2010). Therefore, students who have not developed orthographic pattern structure demonstrate difficulty with spelling words accurately (Masterson & Apel, 2007).

Development of orthographic knowledge (both MGR and orthographic patterns) occurs both implicitly and explicitly (Apel, 2011): implicitly in that children have shown to acquire these skills in the early stages of reading development (e.g., Apel, 2010; Apel, Wolter, & Masterson, 2006; Wolter & Apel, 2010); and explicitly in that research shows instruction in specific literacy skills improves overall orthographic knowledge (e.g., Ehri, 1992; Share, 1999, 2004; Treiman, 1993). However, this development relies on a child's internalised phonological abilities and the interaction between phonological awareness and orthographic knowledge (Lennox & Siegel, 1998).

Many of the skill sets associated with phonological awareness entail a knowledge of phonemes in words (Morais, *et al*., 1998). As orthographic knowledge utilises the relationship between graphemes and phonemes (Ehri & Wilce, 1985), the interrelation between this

linguistic component and phonological awareness is evident (Ehri & Wilce, 1987). For example letter-sound knowledge, which is a fundamental part of orthographic knowledge, pulls heavily from beginning readers/spellers growing phoneme awareness to help sound out and decode words (Moats, 2000). Research shows that the spelling development of young children is influenced by both phonological and orthographic information (e.g., Apel, 2010; Apel & Masterson, 2001; Apel, *et al*., 2006; Barron, 1998; Berninger, *et al*., 2006; Berninger, *et al*., 2010). Berninger *et al.* (2010) examined the growth of phonological, orthographic and morphological awareness in children Grades 1-6 (Years 2-7). Their longitudinal study separated 241 students into two groups (i.e., cohort 1 and 2), dividing the students into a younger group (i.e., cohort 1; Grades 1-3) and an older group (i.e., cohort 2; Grades 3-6) in order to compare the growth models for each group and ascertain if cohorts could be combined to demonstrate student linguistic growth analysis for the overall age band (i.e., ages 6 through 12). Assessments of phonological, orthographic and morphological awareness took place annually over a 4-year period.

Results found phonological and orthographic awareness skills displayed most growth before third grade (i.e., before Year 4) with minimal growth thereafter. Orthographic growth noted older students (i.e., Year 5 and above) demonstrated better orthographic pattern abilities and more reliance on mental representations of words (Treiman & Bourassa, 2000). Conversely, younger students were still developing orthographic knowledge (i.e., MGR and orthographic patterns) to assist spelling (Wolter & Apel, 2010). They also found that students began to acquire morphological skills in early schooling (Lyster, 2002) and continue to develop this awareness in much greater strides than phonological and orthographic skills as they grow

older (Nagy, Berninger, & Abbott, 2006). Overall, Berninger *et al.* (2010) decided that all three linguistic awareness' are dependent upon each other to some degree in order to promote spelling and reading development (Roman, *et al*., 2009).

Supporting the notion that spelling relies on multiple linguistic processes (Kelman & Apel, 2004), the previous study highlights the correlation between phonological awareness and orthographic knowledge during the early years of spelling development. For children with a deficit in phonological awareness (i.e., children with dyslexia), the development of orthographic knowledge is restricted because they are unable to fully utilise the grapheme-phoneme correspondence (Gillon, 2004), and is expressed through inaccurate spelling representations (Nelson, 1980; Pennington, *et al*., 1986; Treiman, 1997). Older children with dyslexia demonstrate similar phonological awareness and spelling abilities to beginning readers and spellers (Cassar, *et al*., 2005), therefore exhibiting moderate levels of phonemic awareness within spelling (Moats, 1983). This mild appreciation of sounds within words leads older children with dyslexia to group phonemes in orthographically incorrect but phonetically accurate ways (Bourassa & Treiman, 2001). For example a student may spell *pile* as *pil*, omitting the silent 'e' at the end of the word. This demonstrates an understanding of phonemes in words whilst revealing a deficiency of orthographic knowledge (i.e., a knowledge of orthography that is similar in development to younger children) (Masterson & Apel, 2007). The ability to rely on phonemic awareness in spelling while lacking orthographic representations demonstrates that practise with orthographic knowledge is needed for continued development (Apel & Masterson, 2001; Kelman & Apel, 2004). Interventions including a range of multiple linguistic components (see Section 2.3) have proven to be more successful for

improving and remediating spelling and reading skills for students with dyslexia, particularly older students who exhibit initial phonological awareness abilities (Kirk & Gillon, 2007). With that in mind, it is important to more fully understand the key role of morphological awareness in spelling development (Larkin & Snowling, 2008).

2.2.3 Morphological Awareness

Morphological awareness is the recognition of morphemes (i.e., the smallest units of meaning) in words (Siegel, 2008). For example the word *play* has one morpheme (*play*) while *played* has two morphemes, *play* and the suffix -*ed* (which signifies past tense). Morphemes can either be free (i.e., have meaning on their own; e.g., *play* in *playground*) or bound (i.e., rely on other morphemic units to have meaning; e.g., -*ed* in *spilled*) (Moats, 2000). Morphological awareness also includes knowledge of roots of words and suffixes (e.g., knowing the spelling of *close* can help with writing the word *closely* as they share the same morpheme) (Treiman & Bourassa, 2000). Since the English language is morphophonemic (i.e., relies on both units of meaning as well as units of sound) (Goodwin & Ahn, 2010), a knowledge of morphemes and morphemic structure is essential for the development of spelling (Nunes, Bryant, & Bindman, 2006).

Although research on morphological awareness is relatively recent (Carlisle, 2010) it demonstrates that the relationship between this linguistic component with the other beginning elements of literacy (i.e., phonological awareness and orthographic knowledge) are interdependent (Roman, *et al*., 2009). Nunes *et al*. (2003) implemented a phonological and morphological intervention with 7 and 8-year-old children who had already learned grapheme-phoneme correspondence. Findings indicated training in both phonological and morphological

awareness improved word recognition; signifying that the two skills are pertinent to reading development (Treiman & Cassar, 1996). However, morphological awareness training demonstrated significant improvement with spelling (Nagy, *et al*., 2006), further illustrating its' importance as a linguistic factor (Carlisle, 2003). As these key linguistic/literacy elements (i.e., phonological awareness, orthographic knowledge and morphological awareness) are linked (Berninger, *et al*., 2010), children who have a better understanding of morphological components within words are able to more fully appreciate and comprehend orthographic patterns they come across in spelling (Carlisle, 2003).

For children with dyslexia, along with phonological and orthographic difficulties, research shows that these students also struggle with morphological awareness in reading and spelling acquisition (Arnbak & Elbro, 2000; Casalis, *et al*., 2004; Elbro & Arnbak, 1996; Gillon, 2004; Goodwin & Ahn, 2010; Siegel, 2008). This is due to deficits in phonological skills and how these affect word recognition and spelling abilities (Fowler & Liberman, 1995). As words are morphophonemic in structure, a deficit that limits phonemic awareness will impact morphological knowledge of words (Moats, 1995). For example the morphological skill of identifying the base word within *decision* (i.e., *decide*) requires the child to have an understanding of the phonological change that occurs (Gillon, 2004). For children with dyslexia this skill is more difficult because limited knowledge of phonological relationships prevents establishment of this connection (Fowler & Liberman, 1995). While some studies have shown that children with dyslexia develop limited morphological abilities (Casalis, *et al*., 2004; Elbro & Arnbak, 1996), they still struggle with more complex morphological awareness

tasks that require phonological changes, thus contributing to lack of ease with spelling and reading (Siegel, 2008).

Overall, difficulties with word recognition and spelling caused by the phonological deficit limits children's morphological experience with words, thus affecting morphological awareness development (Fowler & Liberman, 1995; Gillon, 2004). While this restricts abilities to read and spell at age level (Bourassa, *et al*., 2006), interventions have shown to be effective with remediating these skills for students with dyslexia (Goodwin & Ahn, 2010; see Section 2.3). As previously mentioned, the integration of these skill sets (i.e., the use of multiple linguistic factors; Bourassa & Treiman, 2001) within interventions has more impact on reading and spelling acquisition, especially for children with dyslexia (e.g., Abbott & Berninger, 1999; Arnbak & Elbro, 2000; Berninger, *et al*., 2008; Carlisle, 1987; Torgesen, *et al*., 2001).

2.3 *Intervention Training and Dyslexia*

Intervention training effectively improves reading and spelling of students who struggle with literacy skills (Clay, 2005; Gillon, 2002; Hempenstall, 2008; Lovett, Lacerenza, & Borden, 2000; Torgesen, 2004). Interventions are implemented when a child's literacy skills are not developing adequately, providing explicit or intensive instruction to remediate these difficulties (Torgesen, 2004). Students who are struggling readers and spellers need more one-on-one instruction than their fellow classmates in allowance for the extra processing time which is essential to their development (Clay, 1979, 2005).

In line with the phonological theory, phonological awareness training helps remediate and improve the literacy skills of children with dyslexia (e.g., Hatcher, *et al*., 1994; Lovett, *et*

al., 1994; Puolakanaho, *et al*., 2007; Ryder, Tunmer, & Greaney, 2008; Torgesen, 2006; Torgesen, *et al*., 1994; Vellutino, *et al*., 2008), with most outcomes focusing on reading abilities (e.g., fluency, comprehension, and word identification and attack) rather than spelling. A comparison study (Lovett, *et al*., 1994) between a phonologically-based/word-identification programme and a meta-cognitive-strategy-based intervention (i.e., identifying words through analogies, exploring parts of words, utilising prefixes and suffixes, and variable vowel pronunciations) was employed to determine the most productive method for supporting children with severe dyslexia. Lovett *et al*. (1994) found that explicitly teaching both intervention programmes (i.e., phonological and strategy-based skills) within a small group setting (i.e., two students) helped to improve children's (aged between 7 and 13) word identification and attack skills. Significant improvement to specific phonological deficiencies were made to children who participated in the explicit phonological awareness programme (Lovett, *et al*., 1994). Overall, findings demonstrate the impact of phonological interventions on word identification abilities as well as phonological awareness (Gillon, 2004).

A meta-analysis by Torgesen (2006) also confirmed that interventions that explicitly instruct children with dyslexia on phoneme awareness and other phonological skill sets establish significant improvement with these abilities. However, whilst examining Lovett *et al*. (1994), Torgesen (2006) noted that even though phonological improvement was made, over-arching reading scores (e.g., comprehension, fluency and accuracy) did not improve. Meta-analysis also indicated in some phonologically based intervention studies many children did not retain learned skills longitudinally (e.g., Lovett, *et al*., 1994; McKinney, 1989; Snowling,

Stackhouse, & Rack, 1986). Thus, fallibility within phonologically based interventions exists (Torgesen, 2006).

An exception to this is a longitudinal study (Torgesen, *et al*., 2001) that examined the outcomes of two different instructional approaches: 1) a phonemic sequencing programme for reading, spelling and speech, and 2) an embedded phonemic awareness programme that integrated phonological awareness skills with reading, writing and spelling activities (Torgesen, *et al*., 2001). Focusing on students between 8 and 10 years of age, these interventions were employed using explicit one-to-one direct instruction. Both intervention methods, longitudinally and immediately after the study, showed improvement on students' phonemic awareness and overall reading ability. However, children with severe reading disabilities who had participated in both interventions continued to demonstrate difficulties with reading and phonological awareness after intervention discontinuation (Lovett & Steinbach, 1997). This is mirrored in Vellutino *et al*. (2007). Here response to intervention was used to identify and remediate 6-year-old children with dyslexia. The study utilised a small group intervention (i.e., two to three students) that included activities to promote motivation and development of basic literacy skills including: phonological awareness, knowledge of print concepts, letter identification, knowledge of letter sounds, letter-sound decoding, and sight word identification. Although the intervention showed to be effective at the end of the 6-week duration some students were still recognised to be "at-risk" the following year and were given one-on-one direct instruction. Vellutino *et al*. (2007) reported that 58% of the students who received one-on-one specialised intervention went on to become confident readers 2 years later. The following 42% performed better in reading (i.e., within expected age range on reading

assessments) immediately after the intervention completed, but showed diminished abilities within two years. This indicates the case for continued intervention for students when they become older, and acknowledges the positive effects of phonological awareness interventions for students with dyslexia (Hatcher, *et al*., 2004; Tunmer, 2008). Therefore, providing interventions for older children with dyslexia is critical in order to help these students continue to develop phonological awareness skills that assist them with reading (Vellutino, *et al*., 2008). However, as reading and spelling incorporates multiple linguistic components (e.g., orthographic knowledge and morphological awareness), the most effective interventions integrate other linguistic skill sets (Bourassa & Treiman, 2001).

While phonological interventions have proven to be effective in the development of specific literacy components (such as phonological awareness and reading abilities) (Lovett, *et al*., 1994), interventions that have shown to be successful both immediately and longitudinally for people with dyslexia are integrated with other skills sets (i.e., letter sound knowledge, reading and spelling) (e.g., Abbott & Berninger, 1999; Blaiklock, 2004; Hatcher, *et al*., 1994; Lovett, *et al*., 1994; Lovett, Lacerenza, Borden, *et al*., 2000; Lovett & Steinbach, 1997; Lyster, 2002; Schneider, *et al*., 2000). Bradley and Bryant (1983) found that utilising phonological awareness training alongside letter-sound correlation is more effective to student reading and spelling development than phonological awareness alone. Lovett *et al*. (2000) validate this in a comparison study of three reading intervention programmes: 1) the Phonological Analysis and Blending with Direct Instruction (i.e., PHAB/DI) which aimed to remediate phonological analysis and blending deficits (Lovett, Lacerenza, Borden, *et al*., 2000); 2) a Word Identification Strategy Training programme (i.e., WIST) which practised different word

identification strategies to decode words; and 3) a combination of both programmes. Although there was a diverse age group (i.e., severely reading disabled children between 6 and 13 years of age), it was found that the combination of both intervention programmes had more effect on overall reading skills, word identification and letter-sound knowledge. Findings such as these have been replicated in other studies of students with dyslexia of various age ranges (e.g., Alexander, *et al*., 1991; Gillon & Dodd, 1995, 1997; Lyster, 2002; Schneider, *et al*., 2000; Torgesen, *et al*., 2001; Vellutino, *et al*., 2008). While these studies demonstrate applicable phonological awareness for a variety of ages, research is limited in regards to the role of spelling and how it is an integral part of dyslexia (Cassar, *et al*., 2005; Moats, 1995).

Both spelling and reading rely on the same phonemic, orthographic and morphological spelling strategies (Moats, 2000). While some orthographic strategies have been included in phonological awareness interventions (i.e., letter sound knowledge; e.g., Lovett, Lacerenza, Borden, *et al*., 2000; Vellutino, *et al*., 2008), research on morphological interventions in relation to spelling is relatively recent (Kirk & Gillon, 2009). Minimal research exists discussing morphological interventions (Goodwin & Ahn, 2010), with much of it is focusing on older primary students and the effects of integrating multiple linguistic components within the intervention (e.g., Abbott & Berninger, 1999; Arnbak & Elbro, 2000; Berninger, *et al*., 2008; Casalis, *et al*., 2004; Elbro & Arnbak, 1996; Kirk & Gillon, 2009; Lovett, Lacerenza, Borden, *et al*., 2000; Lovett & Steinbach, 1997; Lyster, 2002; Nunes, Bryant, & Olsson, 2003; Reed, 2008; Siegel, 2008). This is because morphological awareness correlates more directly to reading and spelling skills for older children (Mann & Singson, 2003; Siegel, 2008). One such example is from two studies by Berninger *et al*. (2008) in which older students with dyslexia

(i.e., 9 to 15 years of age) were given small group instruction (6 to 12 students/group). In the first study orthographic and morphological treatment was applied to spelling and writing instruction and compared in effectiveness. The second study examined grapheme-phoneme correspondence with decoding and phonological skills applied to spelling and writing (Berninger, *et al*., 2008). The first study found morphological treatment to positively effect pseudoword spelling more than the orthographic treatment, while the opposite reaction (i.e., orthographic over morphological) occurred for improving real word spelling. It was also established that morphological and orthographic spelling treatments in Study 1 showed greater impact on student spelling and writing performance than the phonological spelling treatment from Study 2.

Goodwin and Ahn (2010) found similar results in their meta-analysis of morphological interventions. They examined 16 studies which utilised various interventions for reading disabled, learning disabled, English language learners, poor spellers, speech and language disabled, and struggling readers. Of these, six were specifically focused on students with dyslexia (i.e., Abbott & Berninger, 1999; Berninger, *et al*., 2003; Berninger, *et al*., 2008; Elbro & Arnbak, 1996; Lovett, Lacerenza, Borden, *et al*., 2000; Lovett & Steinbach, 1997). These studies ranged in age of the participants (i.e., 6 to 13 years of age), modality of intervention (i.e., one-on-one as well as small groups from 3 to 11 students), and activities included within intervention (i.e., morphemic and phonological decoding strategies, orthographic spelling and comprehension strategies). Regardless, morphological components remained the main target for each study (Goodwin & Ahn, 2010). These studies, along with the others examined, demonstrated that morphological interventions were successful with remediating and

improving reading and spelling skills for struggling learners and children with dyslexia (Goodwin & Ahn, 2010); further establishing how phonological deficits effect morphological abilities with reading and spelling (Casalis, *et al*., 2004).

Kirk and Gillon (2009) also utilised integrated morphological awareness as an intervention for poor spellers. Their intervention programme involved a range of linguistic elements including: morphological awareness, orthography (i.e., orthographic knowledge), syntax (i.e., the way sentences are structured), semantics (i.e., the meanings of words and phrases; e.g., *dyslexia* literally translates to difficulty (*dys*) with speech (*lexia*)), and phonology (Kirk & Gillon, 2009). The goal of this intervention was to teach students various orthographic patterns for morphologically simple (e.g., *back*, *bake*, *patch*, *peach*) and complex (e.g., *mopping*, *moping*, *happily*) words to promote generalisation of taught patterns. Intervention sessions included one individual and one small group (i.e., four students/group) each week for 45 minutes over a 3-month span. Activities emphasised in each session included: picture sorts for identification of vowel length; word sorts for morphologically simple words; word sorts for morphologically complex words; increasing word sort complexity; and prompted spelling. Results from this study indicated the positive effects of utilising an intervention programme that focused on teaching students multiple linguistic elements to improve literacy skills (Apel, Masterson, & Hart, 2004). Although this study did not concentrate on children with dyslexia, it serves as further evidence of positive effects seen with integrated multiple linguistic component intervention as a means to improve spelling for students with spelling difficulties, especially dyslexia (Berninger, *et al*., 2003; Bourassa & Treiman, 2001; Moats, 1995).

At this point it is important to note that many of these intervention studies are done within an individual or small group scenario (i.e., a maximum of four students; with exceptions to Berninger, et al., 2008), and take place outside regular classroom instruction. It is thus essential that future research investigate the effectiveness of utilising these strategies within daily classroom activities (Ehri, 1989; Kirk & Gillon, 2009; McNeill, Buckley-Foster, & Gillon, 2011; Moats, 2009a, 2009b; Moats & Lyon, 1996). One such method of approaching this which has shown to help struggling readers and writers is word study (Masterson & Apel, 2007).

2.4 *Taking it to the Classroom – Word Study and Spelling*

Word study is an approach to teaching spelling that incorporates a variety of literacy concepts. Unlike traditional spelling instruction which emphasised rote memorisation (Treiman, 1998), word study focuses around the strategies and skills that are used with spelling, pulling from the close connections between reading and spelling (Joshi, Treiman, Carreker, & Moats, 2008; Snow, Griffin, & Burns, 2005). Activities and strategies taught within word study programmes are designed to focus on the various linguistic properties of words including: phonemic awareness, orthographic knowledge, storage of mental orthographic images (i.e., mental graphemic representations), semantic knowledge and morphological awareness (Masterson & Apel, 2007). For example, a student struggling with orthographic knowledge (e.g., *pech* for *peach*) would practise activities and strategies that helped develop and explore spelling patterns (Apel & Masterson, 2001; Kelman & Apel, 2004; Treiman, 1993). Not only does word study involve decoding and spelling instruction (Masterson & Apel, 2007), but it

pulls from the roots of the English language as a way to demonstrate patterns that do not fit phonemic representations (Moats, 2000).

Since the English language has various roots, the origin of words contributes to the way they are spelled (Moats, 2009a). For example words that end with *-que* are originally from Norman French origin. Also words such as *summer*, *goat* and *bride* originated from Old English. Knowing origin can also help with understanding morphological components of words as well (Joshi, *et al*., 2008). For instance the *-er* and *-or* suffixes denote "one who", such as the words *farmer* and *actor* which signify one who farms and one who acts respectively. The *-er* suffix originated from Old English and is mostly used with everyday words (e.g., *baker*, *teacher*, *butcher*), while in contrast the *-or* suffix is of Latin origin and associated with more lofty and cosmopolitan words (e.g., *director*, *educator*, *professor*) (Joshi, *et al*., 2008). By instructing students in the origins of words, they are able to more firmly make connections with morphemic structures and orthographic patterns (Moats, 2005).

Research has found positive effects in students' reading and spelling abilities for both students with dyslexia and age-appropriate classmates with integration of word origins in spelling and reading instruction (e.g., Abbott & Berninger, 1999; Henry, 1988, 1997, 2010; Joshi, *et al*., 2008; Moats, 2000, 2005; Snowball & Bolton, 1999). Abbot and Berninger (1999) employed a one-on-one intervention (duration: 16 weeks for 1-hour sessions) that specifically concentrated on teaching word origin root words to students with dyslexia (aged 9-13) along with multiple linguistic concepts (i.e., phonological decoding, orthographic awareness, syllable structure and morpheme awareness). Intervention used in this study revealed positive effects to students' reading and spelling skills correlating to results from other studies demonstrating the

effectiveness of integrating word origin along with spelling instruction (Henry, 1988, 1997). Although the students in this study were not as severely dyslexic as in others (Lovett & Steinbach, 1997) it conveys when word origin is integrated into the spelling and reading curriculum, particularly for older primary students and beyond, children are able to more firmly grasp the pronunciation and meaning of words (Moats, 2000).

While not all instances of word study instruction include a history of English language (Joshi, *et al*., 2008; Moats, 2000), it usually entails an in-depth examination of words, how they work, strategies for spelling words, and reinforcing this knowledge with authentic reading and writing activities (Masterson & Apel, 2007; Snowball & Bolton, 1999). Utilising multiple linguistic approaches to spelling have shown positive effect on student spelling achievement (Apel, *et al*., 2004). One such example is Kelman and Apel (2004). This case study examined the effects of utilising assessment to identify deficient linguistic factors and apply specific spelling instruction to meet the participant's needs. They also evaluated the role of spelling instruction on reading when no direct reading instruction is provided (Kelman & Apel, 2004). The participant was an 11-year-old girl who exhibited a history of difficulty in spelling. Through their assessment, involving sample writing plus a series of spelling dictations, Kelman and Apel noted that the participant manifested delayed orthographic knowledge, thus intervention instruction (duration: 11 sessions over 8 weeks for 45 to 90 minutes/session) was tailored to activities emphasising this skill set (e.g., word sort activities, prompted spelling, spelling modelling). Post-intervention results showed significant improvement in both spelling assessments (i.e., sample writing and spelling dictation) as well as improved word-level reading

skills, demonstrating that multiple linguistic instruction not only improves spelling ability but encourages word-level reading as well (Apel & Masterson, 2001).

This is also exhibited in Apel and Masterson's (2001) case study in which similar assessment methods were used (i.e., utilising assessment to gain better insight of participant's linguistic needs). Instead of a one-on-one intervention, the 13-year-old participant underwent small group instruction (i.e., four students) over 15 consecutive weekdays for 90 minutes/session. Instruction occurred over the regular school holiday period. Intervention procedures included: active modelling of taught skills, scaffolding of student response (i.e., encouraging self-regulation strategies), explicit spelling and decoding strategy instruction, and establishing meta-cognitive strategies and positive learning experiences for students (Apel & Masterson, 2001). Activities used were founded in phonemic awareness, orthographic knowledge, morphological awareness and phonemic decoding to establish a multiple linguistic approach to instruction which had proven effective for students with disabilities (Moats, 1995). Results conveyed improvement in spelling and word-level reading, validating the effectiveness of utilising multiple linguistic instruction to promote student learning (Bourassa & Treiman, 2001).

One-on-one word study instruction is an effective intervention, however it is pertinent to examine how this instruction is transferred into the classroom, particularly at the whole group level, and the affects on student learning (Masterson & Apel, 2007). Henry (1987) found that older primary students (i.e., Years 4-6; both normal and learning disabled) had limited knowledge of word structure and morphemic patterns. This study showed that learning and non-learning disabled students who received a mix of decoding, word structure, plus word

origin training improved decoding along with reading and spelling abilities (Henry, 1987). Research discusses how integrated word origin and decoding word study programmes could be applied within regular classroom teaching involving a mix of small and whole group instruction (Henry, 1988, 1997; Henry, *et al*., 1989). Similar to lessons used in a previous study (Henry, 1987), Henry *et al*. (1989) re-examined the relevance of word study instruction centring on multiple linguistic components (i.e., phonological, orthographic and morphological awareness) and word origin to promote student inquiry and exploration of words. The review concluded that word study instruction focusing on these concepts (i.e., linguistic components and word origin) afforded both learning and non-learning disabled students opportunities to develop firm understandings of words and word structure (Henry, 1997). Thus, signifying the importance of this form of instruction on all students' learning (Abbott & Berninger, 1999).

A more recent study by Harris *et al*. (2011) investigated morphological and vocabulary abilities of high-school learning and non-learning disabled students. The study compared two methods of morphological instruction (i.e., word mapping and vocabulary strategy) that have been used to promote vocabulary and spelling. Word mapping strategy centred around morphemic analysis (i.e., analysing the meaning of words based on their morphemic parts) and involved: 1) students breaking words into morphemic parts (i.e., prefix, suffix and root); 2) writing the meaning of the different parts; 3) predicting the definition of the unknown word based on meaning of the word parts; and 4) checking the definition. The vocabulary strategy (i.e., LINCS) utilised mnemonic devices to aid student memorisation and definition recall for vocabulary words. For example in the word *dictate* (i.e., to say or read aloud) the suffix *–tate* could be used within a story, and accompanied by a picture, to help the retainment of the

definition (e.g., I will read aloud to Mrs. Tate) (Harris, *et al*., 2011). A control group of three general education classrooms were used to provide a norm for targeted words used in the teaching programmes. Students with and without learning disabilities from both programmes made significant gains in vocabulary knowledge, however morphological awareness skills for students who participated in word mapping increased significantly more than the vocabulary strategy group. Word mapping students also demonstrated abilities to generalise learned strategies to other words. No significant difference between students with and without learning disabilities in the word mapping group was noted corresponding with other literature that demonstrates reading and spelling skills of children with learning and/or reading disabilities does not correlate to those of their peers (Cassar, *et al*., 2005; Moats, 1983; Torgesen, *et al*., 2001). Although this study focused more on learning disabilities rather than dyslexia, it upholds the importance of teaching morphemic structures of words, which has roots within word origins (Henry, 1988). This helps students build generalisation abilities as well as develop vocabulary knowledge (Carlisle, 1987, 2010; Nagy, *et al*., 2006).

Positive effects have been noted for studies that have researched word study at the whole class level (e.g., Butyniec-Thomas & Woloshyn, 1997; Roberts Frank, 2008; Robinson & Hesse, 1981), however studies in this area are limited (Harris, *et al*., 2011). These studies (with exception to: Butyniec-Thomas & Woloshyn, 1997; Henry, 1987) have concentrated more on the effects within intermediate and high school. Spelling has also not been the main component examined, rather the intervention effects on other reading abilities (e.g., comprehension, word recognition, vocabulary). Nonetheless, numerous multiple linguistic spelling programmes for a variety of ages have been developed (e.g., Allcock, 2008; Allcock,

2010; Henry, 1998, 2010; Moore-Hart, 2010; Pinnell & Fountas, 1998; Rook, 2008; Snowball & Bolton, 1999). The limited number of studies in this area emphasises the need for further research on word study at the whole group level to more fully understand the affects of this instruction on students' spelling, the applicability within classroom learning, and the overall effectiveness of word study programmes.

Research on word study instruction for primary students is more successful with small group instruction rather than whole group as it allows teachers to address specific student needs (Williams, 2009). However, implementing whole group instruction for primary students is still worthwhile as it allows children to work amongst peers whilst inquiring and exploring spelling topics (Snowball & Bolton, 1999). This inquiry and exploration of words, origins and their patterns allows students to make meaningful connections with text (Templeton & Morris, 1999). Students with dyslexia, along with other students with learning difficulties, rely on explicit instruction to initiate connections between reading and spelling (Henry, 1998). Therefore, classroom based word study programmes that utilise direct and inquiry approaches allows instruction to be tailored to various learning needs of students (Allcock, 2010; Henry, 1987, 1988, 1997; Henry, *et al*., 1989; Robinson & Hesse, 1981; Williams, 2009).

For beginning readers and writers, linking spelling instruction and reading is beneficial (Ehri & Wilce, 1987). As students with dyslexia exhibit below age level reading and spelling abilities (Bourassa & Treiman, 2003; Bourassa, *et al*., 2006; Casalis, *et al*., 2004; Cassar, *et al*., 2005; Moats, 1983), word study's use of multiple linguistic strategies is an approach to bridge this link (Ehri, 1989). Although some research shows that overtime children with dyslexia develop compensatory strategies for morphological and orthographic skills that assist with

reading words (e.g., Casalis, *et al*., 2004 study 2; Pennington, *et al*., 1986; Siegel, Share, & Geva, 1995), these abilities do not correlate to or reach the same standard as peers without dyslexia (e.g., Carlisle, 1987; Casalis, *et al*., 2004 study 1). Even still, multiple linguistic factors along with word origin instruction have proven to be effective with students' reading and spelling abilities as it emphasises the importance of transferring taught skills to authentic reading and spelling in order to solidify the relationship between these skills (Masterson & Apel, 2007).

Though most effective spelling interventions have been outside regular classroom instruction (Fulk & Stormont-Spurgin, 1995), the effectiveness of incorporating these interventions in-class for struggling and normal achieving students is evident (Williams, 2009) in that it: 1) allows spelling skills to be accessible to all students, especially those who are already struggling (Henry, 1997); and 2) it integrates varied instructional approaches (i.e., direct and inquiry-based) that when used in tandem provide for advantageous and productive reading development for all learners (Pressley, 2006; Pressley, Roehrig, Bogner, Raphael, & Dolezal, 2002). Although various spelling programmes exist (e.g., Allcock, 2008; Allcock, 2010; Henry, 1998, 2010; Moore-Hart, 2010; Pinnell & Fountas, 1998; Rook, 2008; Snowball & Bolton, 1999), there are limited classroom based studies that examine the impact of integrated word study at the whole class level. Research in this area is pivotal so as to validate previous studies and programmes, and most importantly encourage others to utilise word study teaching within the classroom (Joshi, *et al*., 2008; Masterson & Apel, 2007).

2.5 *Overall Summary*

While dyslexia has a number of associated traits and perspectives, the most common deficit among each perspective is phonological awareness. Phonological deficit not only impacts students' phonological awareness, but also orthographic knowledge and morphological awareness creating deficits in these linguistic areas. Phonologically based interventions that include other linguistic components (i.e., orthographic knowledge and/or morphological awareness) effectively remediate reading and spelling of children with dyslexia. Most research around interventions for dyslexia has been centred on phonological awareness and word recognition whereas less emphasis has been placed on spelling based morphological awareness interventions.

Although interventions investigating spelling are not solely dyslexia specific, as a whole they demonstrate the importance of utilising multiple linguistic elements when remediating students' spelling skills. Most interventions have taken place outside of regular classroom teaching, highlighting that word study could be used as an intermediary to introduce spelling intervention within classroom instruction. While a variety of word study programmes exist, there is limited research on their impact on students with dyslexia, as well as classroom effects for both whole and small group.

A few common notions persist amongst previous research: 1) students with dyslexia exhibit similar literacy skill sets of younger children (e.g., a Year 5 student exhibits the literacy skills of a Year 3 student); 2) multiple linguistic interventions show positive effects for various age-groups, while morphological components to interventions have shown greater impact on children who have already developed a basic level of phonological awareness and orthographic

knowledge; and 3) the next step in intervention research for children with dyslexia would be to examine how to include word study interventions within the classroom setting.

2.6 *Present Study Aims and Goals*

In an effort to fill a previously identified knowledge gap (see Section 2.3), the current study examined the effectiveness of utilising a classroom-wide word study intervention programme on the spelling and reading skills of students with dyslexia. Participants were 9 years of age as children within this age group exhibit moderate levels of phonemic awareness allowing the study to focus on other multiple linguistic skills sets (i.e., orthographic knowledge and morphological awareness).

The first part of the study examined classroom-based spelling interventions for students with dyslexia. Adhering to the phonological theory and previous research in this area (e.g., Kelman & Apel, 2004; Kirk & Gillon, 2009; Snowling, 1998), the current intervention included multiple linguistic components (i.e., phonological, orthographic and morphological skill sets). This intervention was integrated into a small group reading programme to uphold previous research suggestions of incorporating interventions within classroom instruction (McNeill, *et al*., 2011). By utilising a single-subject design, selected students served as their own controls for the study.

The second part of this study related to the effectiveness of using word study intervention programme at the whole group level. The intent of was to investigate effectiveness of a mixed methods instructional approach (i.e., direct and inquiry-based

instruction) that integrated word origin and multiple linguistic spelling components within word study to improve spelling skills of 9-year-old students.

The goals of this study explored:

1) The effects of multiple linguistic intervention activities within small group word study on the spelling students with dyslexia, and if this intervention affected reading abilities.
2) The effects of utilising mixed methods (i.e., inquiry-based/direct-instruction) teaching in an integrated word origin and multiple linguistic word study programme on spelling development.

2.7 *Research Questions*

1) What is the efficacy of incorporating a small group multiple linguistic intervention within the classroom on the spelling skills of 9-year-old students with dyslexia, and are there noticeable affects in reading abilities?
2) What is the efficacy of incorporating a whole group word study intervention programme within the classroom on all students' (i.e., both reading and non-reading disabled) spelling abilities?

3. Methodologies

3.1 *Design*

This study employed two research methods to establish the effectiveness of a word study intervention programme in promoting spelling development. A single-subject design with repeated measures was used to evaluate the effectiveness of a small group word study intervention programme in enhancing the spelling skills of two students with dyslexia. The design was separated into three phases (i.e., pre-intervention, intervention and post-intervention). Small group intervention (i.e., the small group teaching programme) was applied during the intervention phase. The diagram below displays the layout of this design (see Figure 1).

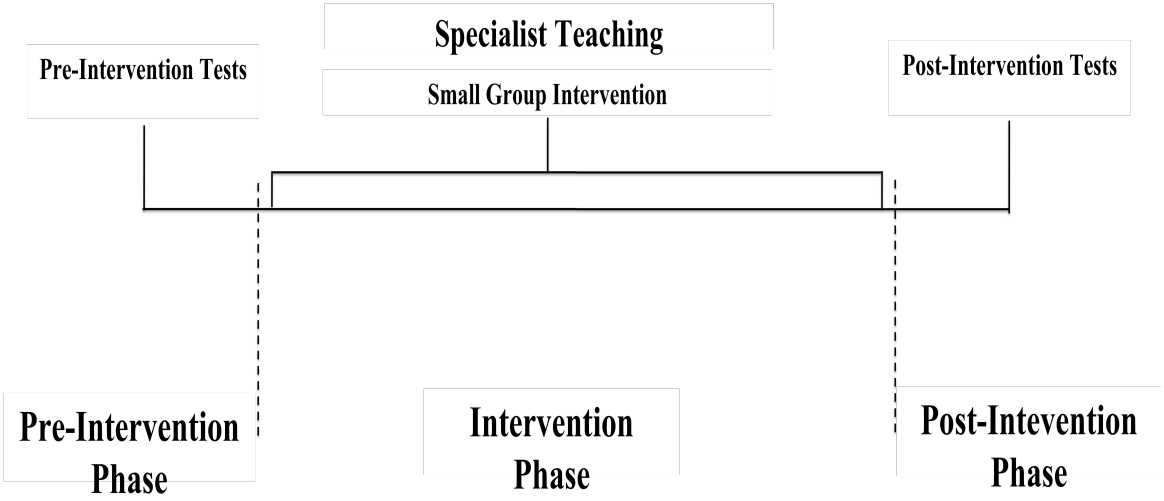

Figure 1. Single-subject case study design for word study intervention programme.

The second research method employed a comparative group design (see Figure 2), using pre-post testing, to evaluate the effectiveness of the specialist teaching programme

conducted at the class level in promoting spelling development. In this design, the spelling performance of the 9-year-old students in classroom A (i.e., the intervention classroom, n = 7) and classroom B (i.e., the comparison classroom; n = 7) were compared. Whole group instruction (i.e., mixed direct/inquiry-based teaching programme) was implemented between pre-post testing.

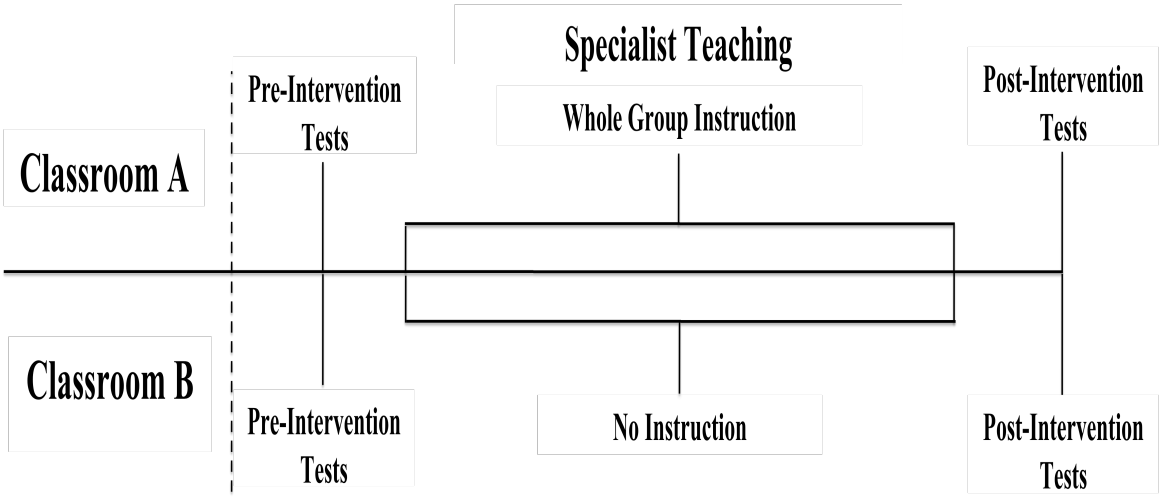

Figure 2. Whole-group comparison design for word study intervention programme.

3.2 *Participant Recruitment Process*

The research took place in a decile 10 Catholic, full-primary school in the Canterbury region of New Zealand. The principal and associate teachers from the Year 4/5 classroom[1] identified 6 of the 30 students from this classroom, aged between 8 years 2 months and 9 years 8 months, with low progress reading and spelling skills that could not be attributed to another difficulty (e.g., autism, developmental disorder, sensory impairment) as potential case study

[1] Only one Year 4/5 classroom at the school.

participants. One of these students (Student 2) had already been identified with dyslexia. The following assessment battery was used to determine whether the literacy skills of the referred students matched the dyslexia profile employed in the current study (i.e., students who presented with literacy difficulties that were attributable to a specific phonological deficit). Students that presented with literacy difficulty that was not attributable to a specific phonological deficit (i.e., had phonological processing skills within the expected range for their age and/or presented with comparable receptive vocabulary and phonological processing skills; Gough & Tunmer, 1986; see Section 2.1.3) were excluded from selection as case study students.

3.2.1 Participant Recruitment Assessment Battery

The following measures were administered individually over one session to identify students who fit the dyslexia profile outlined above.

- Peabody Picture Vocabulary Test, PPVT-4 (Dunn & Dunn, 1997): This norm-referenced test provides a measure of students' receptive vocabulary. In the assessment, students are asked to point to one of four pictures that relate to particular vocabulary items. A standard score, demonstrating whether the receptive vocabulary level of the student was within the expected range for their age, was collected for analysis.

- Neale Analysis of Reading Ability, NARA (Neale, 1997): The NARA provides a norm-referenced measure of reading comprehension and accuracy. Students read passages aloud while the assessor marks the number of errors made during the reading. If the student reads a word inaccurately, then the assessor provides the correct word. At the end of each passage, the child orally answers a series of comprehension questions about the story without going back to

the text. Standardised (i.e., stanine) scores for accuracy, comprehension and rate were collected for analysis to determine where children were ranked within their age group.

- Burt Word Reading Test (Gilmore, Croft, & Reid, 1981): This New Zealand standardised test is an individually administered assessment that is used to measure children's single word recognition skills. During this assessment, students are required to read words that become progressively more complex. Discontinuation of this assessment occurs when students read 10 consecutive words incorrectly. The score collected from this assessment included the equivalent age band of the student.

- Queensland University Inventory of Literacy (Dodd, Holm, Oerlemans, & McCormack, 1996): This assessment provides a norm referenced measure of phonological decoding, phonological encoding and phonological awareness skills. The following subtests were administered:

- Non-word spelling: In this subtest, the assessor reads a list of 24 pseudo-words that increase in length and complexity (e.g., *dorf*, *strecker*, *strimperdiction*). The student is instructed to write plausible spellings of each word that reflects the pronunciation of the word. The assessment was used to evaluate phonological and orthographic encoding skills.
- Non-word reading: In this subtest, the student reads a list of 24 pseudo-words that increase in length and complexity (e.g., *acked*, *strinter*, *ocksidgen*). Discontinuation occurs after four consecutive errors. The assessment was used to evaluate student's phonological decoding skills.
- Phoneme awareness sub-tests

- Phoneme detection: In this subtest, the assessor orally presents four words and the student must identify the odd one out in the set. Sound changes occur in the first, end, last and middle of words. For example, in the word set '*bed*, *bag*, *mop*, *bus'*, the word *mop* does not fit the initial sound pattern. There were 12 items in this sub-test.
- Phoneme segmentation: In this subtest, students are asked to identify the number of phonemes (i.e., speech sounds) in a series of real and pseudo-words (i.e., eight and four respectively). For example, *big* has three sounds. There were 12 items in this sub-test.
- Phoneme manipulation: In this subtest, students are asked to delete a sound from a target word. For example, *told* without the /t/ sounds like *old*. There were 10 items in this sub-test.

Scaled scores (i.e., an adjusted score from the original raw score that equates to the student's performance level compared to their age performance level) were collected for each of the subtests of the QUIL. A score lower than 7 equates to performance below the expected range for a child's age, a score of 7 to 13 equates to performance within the expected range for a child's age, and a score over 13 equates to advanced performance for a child's age.

3.2.2 Results of Assessment Battery

The scores from the six referred students are presented in Table 1 below. While all referred students demonstrated below age-level literacy skills in at least one area of reading or writing, only two of the referred students matched the dyslexia profile used in this study (Student 1 and Student 2). Their scores reflected age-appropriate and/or advanced vocabulary

(i.e., a standard score of 85 and above on the PPVT-4) with below age-level phonological skills (i.e., a scaled score below 7 on at least four of the five sub-tests of the QUIL that were administered).

The remaining students were excluded from the study because their scores did not fit the profile being examined in the study. Student 3 displayed non-specific literacy needs, scoring below expected age ranges on the literacy, receptive vocabulary and phonological awareness assessments. Student 4 presented with age-appropriate receptive vocabulary with low phonological awareness skills, but was excluded for participation because his word recognition skills and reading rate were age-appropriate. Student 5 presented with receptive vocabulary difficulty, age-appropriate performance on three of the five subtests of the QUIL, and average word recognition skills. Finally, Student 6 was excluded as he performed within normal limits on two of the five subtests of the QUIL (i.e., did not meet the criteria for phonological awareness impairment used in the study).

Table 1. Scores of referred students on Assessment Battery

Student	**S1**	**S2**	S3	S4	S5	S6
Age	9.01	9.03	8.07	8.02	8.08	9.08
Gender	Male	Male	Female	Male	Male	Male
PPVT Standard Score	114	97	83*	101	84*	96
NARA Accuracy Stanine Score	2*	1*	3*	4*	4*	2*
NARA Comprehension Stanine Score	3*	1*	0*	2*	1*	3*
NARA Rate Stanine Score	5	4	4	4	6	3*
BURT Equivalent Age Band	7.11-8.02*	6.06-6.09*	8.04-8.07	8.0-8.06	9.11-10.05	7.04-7.11*
Non-word Spelling Scaled Score	3*	3*	4*	4*	8	3*
Non-word Reading Scaled Score	3*	3*	3*	3*	11	3*
Phoneme Detection Scaled Score	4*	3*	4*	3*	4*	10
Phoneme Segmentation Scaled Score	11	8	12	13	4*	11
Phoneme Manipulation Scaled Score	3*	4*	3*	3*	10	3*

Note. Std Score expected range for a student's age is 85-115; Scaled Score expected range for a student's age is 7-13; Stanine Score expected range for a student's age is 4-6; PPVT = Peabody Picture Vocabulary Test (Dunn & Dunn, 1997); NARA = Neale Analysis of Reading Accuracy (Neale, 1997); BURT = Burt Word Reading Test (Gilmore, et al., 1981); * signifies student scored below expected age range.

3.2.3 Case Study Participants: Background information

Two male students, Student 1 and Student 2, were selected as case study participants for this intervention. Student 1 was aged 9 years 1 month at the beginning of the study, and Student 2 was 9 years 3 months. Student 2 had previously undergone testing with the SpeLD NZ organisation and been identified as dyslexic. At the time of the study, he was receiving one-on-one intervention support with a SpeLD instructor once a week as well as undergoing extra literacy support with a reading specialist two-times-per-week. Small group intervention and the one-on-one SpeLD interventions were organised so they did not occur on the same day, and it was arranged that Student 2 participated in small group instruction prior to visiting the reading specialist. Student 1 was not receiving any extra literacy support.

3.2.4 Whole Group Participants: Background information

All students from classroom A (i.e., 30 students including Student 1 and Student 2) participated in the whole group instruction (i.e., inquiry-based teaching programme). Ages for these students ranged from 8 years 5 months to 10 years 0 months at initial assessments. Classroom B participated as a comparison group to evaluate the effectiveness of the inquiry-based teaching programme at the class level. The ages of these students ranged between 9 years 3 months to 11 years 3 months. Only the 9-year-old students from each class were assessed during pre and post-tests so as to provide a more accurate comparison of spelling ability between the two classes and for the specified age group (i.e., 9 years of age).

3.3 *Procedure*

3.3.1 Single-Subject Case Study Design: Measures

3.3.1.1 **Pre-Intervention Repeated Measures**

Repeated assessment measures for spelling were used to track the progress of Student 1 and Student 2 in response to the small group teaching programme within the single-subject design. These repeated measures were initially used to establish a stable baseline for each child during the pre-intervention stage (i.e., prior to the implementation of small group instruction). The measures were repeated on three occasions over a 2-week period with 2 to 3 days between the three assessments. It is important to establish baseline performance during the pre-intervention phase in single-subject research design so that comparison between the rate of growth before and after implementation of an intervention can be established (Portney & Watkins, 2009).

Each repeated measure (i.e., word list A, B, and C) included 13 words (i.e., a total of 39 words) that the participants had to spell. The words in each list were matched so that the same spelling patterns were evaluated within each repeated measure (e.g., *pa<u>tch</u>*, *re<u>tch</u>* and *ca<u>tch</u>*). This was done to insure each repeated measure assessed the same spelling pattern without introducing practise effects by repeatedly assessing the same spelling words on three occasions in a short time frame. Twenty-six words were directly incorporated into the small-group teaching programme and probed again throughout the intervention (i.e., word lists A and B; taught words). The remaining 13 words (i.e., word list C) were not used during the small-group teaching programme. These generalisation measures (i.e., untaught words with taught structures; e.g., does spelling of *retch* improve following focus on the *-tch* structure in *catch*

and *patch*) were used to verify if case study students were learning orthographic and morphological patterns that were introduced and practised during the teaching sessions, or utilising rote memorisation of specific items to improve spelling scores during the intervention.

Repeated assessment of control words (i.e., untaught words with untaught structures; word lists D, E, F) was also conducted during the pre-intervention and post-intervention phases. These word lists consisted of seven words each (i.e., 21 words total), which were assessed at two-day intervals during the pre-intervention and post-intervention phases. The orthographic and morphological patterns for these words were not included in the intervention sessions. These words were assessed to evaluate whether there were specific intervention effects for the words and patterns targeted in the intervention or whether any documented changes in spelling ability was likely due to general maturation in spelling over the course of the study. See Appendix A for a full list of the repeated measures used.

The figure below depicts the timeline of administration of the repeated measure assessments throughout each phase of the single-subject design.

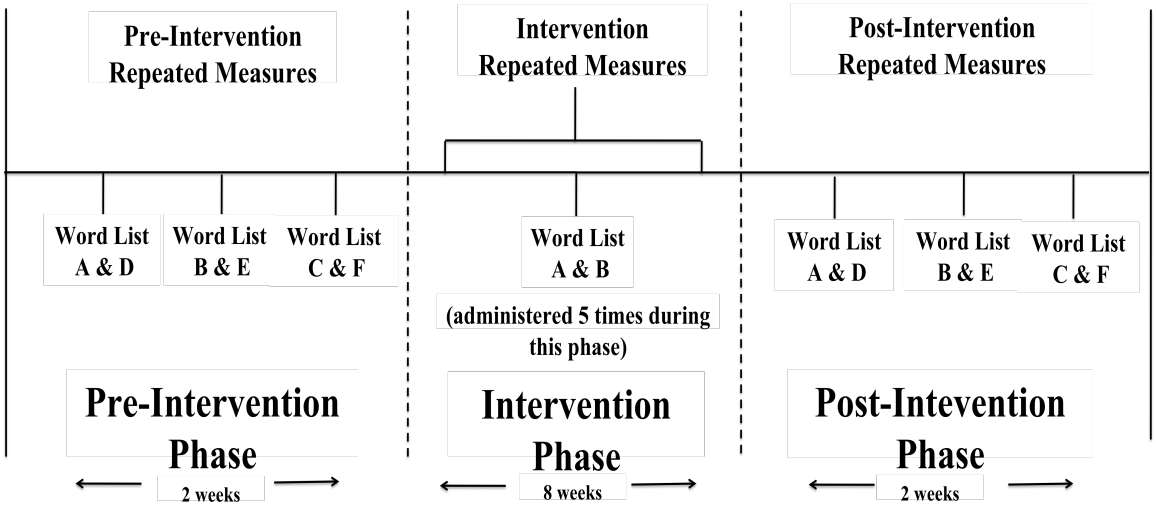

Figure 3. Timeline of administration of the repeated measures throughout the single-subject design.

Repeated measure assessments were scored using a raw score (i.e., out of 13 for taught and generalisation measures, and out of 7 for control measures) and a percent elements correct score using the Spelling Sensitivity Scoring system (Masterson & Apel, 2010). The Spelling Sensitivity Score examines the different linguistic elements within a word and provides a more sensitive measure of spelling development than raw score alone (Masterson & Apel, 2010). The elements are separated out into phonemes, juncture changes and suffixes. For example the words mop and mope are both divided into three elements: ‘m’-‘o’-‘p’; ‘m’-‘o’(consonant)‘e’-‘p’. In the word mope the ‘o’ is paired with the ‘e’ as it is a digraph representing the vowel sound (i.e., one element) within the target word. With morphologically complex words: the base word is divided into its constituent sounds (each representing one element), syllable junctures are considered one element, and the suffix is considered a single element (e.g.,

mopping = ‘m’-‘o’-‘p’, three elements in the base word; ‘p’, one element for the juncture; *-ing*, one element for the suffix). Table 2 demonstrates an example of scoring using the spelling sensitivity system for a student’s spelling of the words *mop*, *mope*, *mopping*, and *pill*.

Table 2. Example of Spelling Sensitivity Scoring (adapted from Masterson & Apel, 2010).

Target Word	M	O	P	M	O(consonant)E		P	M	O	P	P	ING		P	I	LL
Student’s Attempt	M	O	P	M	O	P	–	M	O	P	–	ING		P	I	L–
Points	3[a]	3	3	3	1[b]	3		3	3	3	0[c]	3		3	3	2[d]

Note. The arrow points to the consonant that comes before the E; [a] = all elements correct; [b] = sound, juncture or suffix is spelled incorrectly and does not have a plausible spelling; [c] = sound, juncture or suffix is not represented; [d] = sound, juncture or suffix is spelled incorrectly, but still maintains a plausible spelling that is used in some words.

For example, *mopping* has a total of 15 element points (3 points for each sound in the base word, 3 points for the juncture ‘p’, and 3 points for the suffix *-ing*). Each element is then scored in the following manner: 3 points are awarded for each element that is correctly represented, 2 points are awarded for if the element is spelled incorrectly but plausibly (e.g., if a student spells *pill* as *pil*, then 2 points are awarded for the final ‘ll’ element of that word), 1 point is awarded if the element is spelled incorrectly and does not have a plausible spelling (e.g., if the student spells *mope* as *mop*, then 1 point would be awarded for the vowel element in that word), and 0 points are awarded if the element is omitted altogether (e.g., if a student spells *stop* as *sop*, they receive no points for their representation of the ‘t’ element in that word).

A percent elements correct measure was calculated from the above analysis (i.e., element points gained by student / total number of elements in the sample x 100). As the number of words and elements varied between taught, generalisation and control measures, using a percentage score allowed comparison amongst these assessments.

3.3.1.2 **Intervention Repeated Measures**

Repeated measures for spelling of taught words (i.e., word list A and B) were also administered once a week during the intervention phase (in weeks 4, 5, 6, 7, and 8) to monitor the on-going progress of the two case study participants. Raw scores and a percent elements correct score were collected for analysis.

3.3.1.3 **Post-Intervention Repeated Measures**

After completion of the intervention, taught repeated measures (i.e., word lists A and B), generalisation measures (i.e., word list C) and control measures (i.e., word lists D, E, F) were re-administered to assess case study student spelling. Raw scores and a percent elements correct score were collected for analysis.

3.3.1.4 **Pre- and Post-Intervention Testing: Case study participants**

In addition to the repeated spelling measures outlined above, the following assessments were administered on a single occasion at pre- and post- intervention to monitor any broader effects of the small group intervention on the case study participants' spelling, word recognition, morphological awareness, phonological awareness and reading comprehension. Each assessment was administered twice over the duration of the study (i.e., once pre- and post-intervention). The results for pre-intervention testing for the case study students were used from their original battery assessment (i.e., results from the selection process) so as to avoid

practise effects. Many of these assessments are described in the participant recruitment process section above:

- Neale Analysis of Reading (NARA) (Neale, 1997)

- Burt Word Reading Test (Gilmore, *et al*., 1981)

- Queensland University Inventory of Literacy (Dodd, *et al*., 1996) subtests:

  - Non-word reading
  - Non-word spelling
  - Phoneme manipulation
  - Phoneme detection
  - Phoneme segmentation

- Base Word Detection task (Kirk & Gillon, 2007): This morphological awareness task is used to assess a child's ability to orally identify base words within morphologically complex words. For example the assessor will ask, "Is there a smaller word at the beginning of *assertive*". If the child responds in the affirmative, the assessor then asks the child to "tell me what the smaller word is" (i.e., *assert*). Finally, the child is then asked if their response (e.g., *assert*) relates in meaning to the dictated word (e.g., *assertive*). Stimulus items included phonologically opaque and phonologically transparent words (Kirk & Gillon, 2009). Phonologically transparent words are those in which the base word is pronounced in the same manner in the base and derived form of the word (e.g., *fame – famous*). Conversely, phonologically opaque words are those in which the base word is pronounced differently in its derived form (e.g., *space – spacious*; *heal – health*). A raw score out of seven and nine for phonologically transparent and opaque words respectively was collected for analysis.

- Test of Written Spelling – Fourth Edition, TWS-4 (Larsen, Hammill, & Moats, 1999): This standardised assessment is used to document any changes in participant's spelling skills in comparison to normative data. A raw score, standard score and percent spelling elements correct score (Masterson & Apel, 2010) were collected for these assessments.

A timeline of all measures used during the single-subject case study design is shown below (Figure 4).

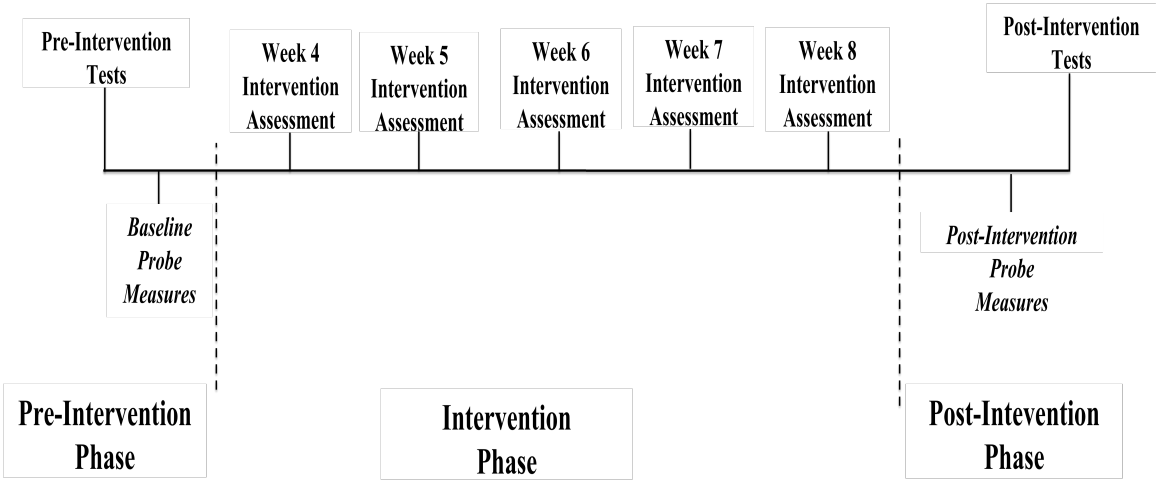

Figure 4. Timeline of probing measures for single-subject word study interventions.

3.3.2 Comparative Group Design: Whole class measures

The following curriculum-based measures were administered to the 9-year-old children from classroom A (intervention classroom, $n = 7$) and classroom B (comparison classroom, $n = 7$) prior to the implementation of whole group instruction and directly after its completion. Testing took place over a single session for pre-assessment, and over 2 sessions for post-assessments (i.e., Day 1: Gap Analysis; Day 2: Pseudoword Spelling Test and Spelling

Dictation Task). Whole class pre- and post-intervention assessments were administered as a group and included the following measures:

- Gap Analysis Assessment 1 (Allcock, 2010): In this assessment, students are required to independently complete a series of spelling tasks including: dictated spelling, apostrophe identification, plurals and prefixes. It is used to identify specific spelling errors students are making (i.e. vowel sounds, orthographic patterns, apostrophes). A raw score out of 100 (the total items) was collected.

- Pseudoword Spelling Test (Allcock, 2010): In this assessment, the administrator dictates a list of 31 non-words that are structured similarly to real words for students to spell. For example *zinner*, which is similar in structure to *dinner*. This assessment gives information regarding students' use of phonological awareness and orthographic knowledge in their spelling attempts. A raw score out of 31 and a percent elements correct score were calculated for this assessment.

- Spelling Dictation Task (Kirk & Gillon, 2007): In this assessment, the administrator dictates a series of 20 words that contain 10 base word and derived pairs (e.g., photograph-photography; heal-health; grow-growth) for children to spell. The items are presented in random order so that members of a morphological pair are not assessed consecutively. This task is used to identify whether students are using a morphological strategy in their spelling attempts (i.e., whether spelling of the base word is maintained in its free and derived form). Scoring for this task included a raw score out of 20 and a percent elements correct score.

3.4 *Specialist Teaching Programme*

Specialist teaching included small group intervention sessions 3 days a week and one whole group instructional session per week. Each session for the small group intervention was approximately 20-30 minutes during the allotted time for small group reading[2] instruction within the classroom as scheduled by the classroom teacher. Twenty-four small group sessions were conducted within an 8-week period. A small group of eight students, including Student 1 and Student 2, were identified as low-level readers by the classroom teacher and took part in these sessions. These eight students were different from the seven 9-year-old students who were used for the whole group comparison study.

Whole group instruction (i.e., instruction to the 30 students from classroom A) occurred once a week for 45-60 minutes for eight sessions. These sessions took place during whole group reading time[3] as scheduled by the classroom A teacher for an hour.

3.4.1 Small Group Intervention

3.4.1.1 **Overview and Aims**

Small group interventions were based on the intervention programme detailed in Kirk and Gillon (2009) (see Section 2.3). The programme was adapted so that it could be

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[2] Small group reading (i.e., guided reading) involves students in a classroom being divided into groups based on their reading levels. The teacher meets daily with each group for an allotted time to work on specific reading skills. Groups vary from three to eight students, with a suggested four groups per classroom (Ministry of Education, 2003).

[3] Whole group reading instruction involves reading activities that include the whole class (e.g., shared reading, read-aloud). These activities help children build connections with the learning community of the classroom and school (Ministry of Education, 2003). It is the responsibility of the classroom teacher to develop and implement literacy lessons (both whole and small group) that are relevant to the New Zealand Curriculum and National Standards (Ministry of Education, 2007).

implemented within a small group (i.e., eight students) setting and incorporated into the classroom's daily reading programme. Due to the high number of students within the classroom, and to allow for quieter learning environment, small group teaching occurred outside of the classroom. Lessons were conducted in three places: outside directly in front of the classroom, in the library, and in the staff room. All lessons were based around the theme for the term (i.e., food) and included a range of texts from school journals that corresponded with the reading ages of the students. Lessons were specifically planned in accordance with the New Zealand Curriculum and the New Zealand reading and writing standards. Students were explicitly informed of learning intentions so as to provide coherence with a New Zealand classroom setting and teaching/curriculum expectations from the Ministry of Education (Ministry of Education, 2007). An example of a weekly overview for the small-group teaching programme is found in Appendix B.

3.4.1.2 **Teaching Targets**

Intervention tasks utilized multiple linguistic components to guide students with mastering frequently occurring patterns, helping them to make generalisation to other words (Kirk & Gillon, 2009). The following patterns were targeted during the teaching programme:

- Patterns in morphologically simple words where the vowel length determines the spelling of the final sound in the word including: the magic 'e' (e.g., *flake*); *-ke* and *-ck* (e.g., *bake* and *back* respectively); *-ch* and *-tch* (e.g., *peach* and *patch* respectively); and *-g*, *-ge*, and *-dge* (e.g., *hug*, *huge*, and *hedge* respectively).

- Patterns in morphologically complex words that involve modification to the spelling of the base word when the suffix is added. This included examples of consonant doubling and

dropping the final ‘e’ in the base word. These spelling changes occur only when specific suffixes are used: *-ed*, *-ing*, and *-y* (e.g., *piled*, *mopping* and *icy* respectively).

Most of the teaching was centred on patterns in morphologically simple words as a majority of the students in the small group struggled with orthographic patterns in spelling (i.e., corresponding letters with vowel sounds and misrepresenting long and short vowels). This was demonstrated by students’ difficulties differentiating between long and short vowels in word sorts. The adapted intervention tasks that were a primary focus during the specialist teaching sessions focused around sorting activities and spelling prompts (see below). Word sorts were used daily because they encourage children to recognize generalisations of patterns across words (Zutell, 1998).

3.4.1.3 **Intervention Activities: Weeks one to three**

The following activities were introduced and practised during the first three weeks of the small group intervention.

- Sound card practise: Letter blocks (i.e., sound cards) with individual letters (e.g., a, b, c), long vowels (e.g., /ea/) and digraphs (e.g., /ch/) were printed, cut and laminated for each student. These letter blocks were taken from “The Gillon Phonological Awareness Training (PAT) Programme” (Gillon, 2008). Sound cards were used to help students in the small group practise vowel length in morphologically simple and complex words. Students would use the letter block cards to physically build words. As students became more aware of orthographic patterns in words, consonant digraphs (e.g., /ch/, /sh/, /ck/) and long vowel pattern (e.g., /ea/, /ie/) letter blocks took the place of using single letter blocks. Sound cards were used daily with students and employed explicitly at the beginning of each week. Students also used these

sounds cards as an independent and partner activity to practise taught words (i.e., word lists A and B) along with a sound card practise sheet (see Appendix C). A new practise sheet was supplied to each student at the beginning of each week

Since students struggled with discriminating between long and short vowels, a short vowel identification sheet was supplied at the beginning of the intervention to provide a visual aid for these students (see Appendix D). Words and pictures from this sheet were taken from probes A and B (i.e., taught probes; with exception to short 'e' as no short 'e' words were used in taught words with taught structures). Sound cards were used throughout the course of the intervention (i.e., from week one to week eight).

- Words sorts for identifying vowel length: As students demonstrated difficulties in the first week of intervention with differentiating between long and short vowels, word sorts that focused on sorting words of similar vowel length (i.e., sorting only short or long vowels) were introduced. Students were given a list of words with either short or long vowels and asked to match the word to the appropriate vowel sound. For example if a student was sorting short vowels the word *catch* would correspond to the short 'a' sound (i.e., /æ/) whereas *pop* corresponded with the short 'o' sound (i.e., /ɒ/). Vowel sounds were depicted in columns on a corresponding sheet. Students would either write the word in the correct column, or cut and paste the word from their list. This activity served to explicitly instruct students of specific orthographic patterns (see Tables below) as well as develop a foundation of basic orthographic knowledge (see Section 2.2.2) for them to use during the course of the intervention. A student example of a word sort for vowel length identification is shown in Appendix E.

Table 3. Example of short vowel word sort

/æ/	/e/	/ɪ/	/ɒ/	/ʌ/
Catch	Egg	Trick	Pop	Sun
Pan	Leg	Mix	Mop	Fun

Note. Shown are selected words that were used to sort short vowels during the second week of the word study intervention.

Table 4. Example of long vowel word sort

/eɪ/	/aɪ/	Other long vowels
Chase	Ice	Show
Bakes	Shine	Home

Note. Shown is an example of select words that were used to identify long vowels during the third week of the word study intervention.

3.4.1.4 **Intervention Activities: Weeks four to seven**

The activities that were introduced and practised over the course of weeks four to seven included:

- Word sorts for morphologically simple words: After students showed proficiency with identifying vowel length independently, word sorts comparing vowel lengths were introduced (see Table 5). To emphasise the understanding of the role vowel length plays in morphologically simple words, students sorted words that were phonologically identical, except for vowel length. For example, the word *trick* has a short /ɪ/ sound, whereas *trike* has a long /aɪ/ sound. The orthographic modifications that were targeted included: -*ke* and -*ck* (e.g., *bake*,

back); *-ch*, and *-tch* (e.g., *peach*, *patch*); *-ge* and *-dge* (e.g., *huge*, *hedge*); and hard 'g' versus soft 'g' (e.g., *wag*, *wage*). Cue phrases were used to help students remember the orthographic patterns of words with short vowels: short vowels are little piggies, they are very greedy, they take an extra consonant (Kirk & Gillon, 2009). A student example of morphologically simple word sorts is found in Appendix F.

Table 5. Example of vowel length comparison word sort

Short Vowel /k/	Long Vowel /k/	Short Vowel /ch/	Long Vowel /ch/	Hard /g/	Soft /g/ Short Vowel	Soft /g/ Long Vowel
Back	Bake	patch	peach	hug	Huge	hedge
Mack	Make	match	teach	pog	Poge	podge

Note. Shown is an example of select words that were used for the long versus short vowel comparison word sort during week six of the word study intervention.

- Identification of morphologically simple and complex words within text: To reiterate the connection between spelling patterns students were learning and text, students identified morphologically simple words with similar vowel lengths in selected passages from school journals that centred around the theme for the term. Length of the selected passages consisted of a maximum of 50 words (i.e., a paragraph to two-pages, depending on the difficulty of the text). Immediately after reading the passage, students were asked as a group if they could identify any short or long vowels within a passage: "can you find any words that have short vowels in the section we just read? Great, put a line under it and see if you can find any more"! To avoid confusion, students focused on identifying morphologically simple words with similar

vowels lengths (i.e., only identifying the short vowels or only identifying the long vowels). This helped to strengthen student understanding of vowel length and its influence on orthographic patterns. It also encouraged inquiry-based learning and student exploration of the text, thus allowing students to make connections on their own. An example of a student's vowel identification within text is found in Appendix G.

- Prompted spelling: From week five of the intervention onwards, students began prompted spelling. Once a week students were broken into two groups of four and asked to spell a list of four words they had encountered throughout the various sorting and reading group activities. Students were given verbal prompts to help them discover and practise patterns within morphologically simple and complex words. The prompts were modified from examples used in Kirk and Gillon (2009) to accommodate for a small group scenario.

  - Example of prompts for a morphologically simple word (adapted from Kirk & Gillon, 2009; used only during weeks five and six):

    I'd like you to spell the word *trick*. I'll use the word *trick* in a sentence so that you can think about what it means: *The magician performed a magic trick.* Now before we write anything, I want you to think of the vowel sound in your head. Now say that sound out-loud. That's right, the vowel sound is /ɪ/. Think in your head if /ɪ/ is a short or long vowel. Now show me with your hands whether it is short or long[4]. You are correct the vowel sound in *trick* is short. If the vowel sound is short think in your head how we would spell that final /k/ sound, then write it on your paper. That's right, you spell the final /k/ sound with the

[4] Hands close together resembled short vowel, hands far apart represented long vowels.

letters ‘ck’ because short vowels are greedy, they like an extra consonant. Now write the word *trick*.

- Example of prompts for a morphologically complex word (adapted from Kirk & Gillon, 2009; used only during weeks seven and eight):

  I’d like you to spell the word *mopping*. I’ll use the word *mopping* in a sentence so that you can think about what it means: *The boy was mopping the floor*. Before you write anything, I want you to think in your head what the vowel sound in the base word is. Now say that sound out-loud. That’s right, the vowel sound is /ɒ/. Now show me with your hands if /ɒ/ is a long or short vowel. You are correct the vowel sound in *mop* is short. Now spell the base word. Do you have to make any changes to the base word when you add the suffix? Show me a thumb up if you do and a thumb down if you don’t. Yes, you do. Because the vowel sound in *mop* is short, you will have to double the final ‘p’. Now finish writing the word *mopping*.

Prompted spelling continued through to week eight of the small group intervention.

3.4.1.5 **Intervention Activities: Weeks seven to eight**

Along with sound cards and prompted spelling, word sorts for morphologically complex words were utilised the last two weeks of intervention. These word sorts included base words and suffixes that were orthographically and semantically transparent. They were introduced to increase student knowledge of morphological spelling of words. These word sorts focused on orthographic changes to the base words, such as consonant doubling (e.g., *mop – mopped*) and final ‘e’ drop (e.g., *price – pricy*). The morphological suffix changes that were utilised include:

-ed (e.g., *mope – moped*), *-ing* (e.g., *mop – mopping*) and *-y* (e.g., *ice – icy*). Students were given a list of words and asked to add the appropriate ending and make the necessary orthographic changes to each word. For example when affixing *-ed* or *-ing* to *mop*, the juncture 'p' is added when the suffix is attached (e.g., *mopped* and *mopping* respectively). A variety of skill sets were practised for these word sorts (Table 6). A student example of this word sort is found in Appendix H.

Table 6. Example of word sort for morphologically complex words

Word	Word + ed	Word + ing
Back	backed	Backing
Mope	moped	Moping
Pill	pilled	Pilling
Patch	patched	Patching
Mop	mopped	Mopping

Note. Shown is an example of select words that were used for the morphologically complex word sort during week seven of the word study intervention.

In each of these suffix additions, changes to base words were discussed and patterns were verbalised (e.g., *mopped* has two 'p's because short vowels are greedy and they need an extra consonant; to change *mope* to *moped*, drop the 'e' and add *-ed*). This helped students solidify patterns encountered.

3.4.2 Whole Group Teaching Structure

Whole group instruction was designed to encompass a mixed methods approach to word study (i.e., incorporating direct instruction with inquiry-based activities). The activities that were highlighted in the whole group teaching sessions included:

- An overview of the history of the English language and origin of words
    - Student made posters depicting information about the places, countries and people that have influenced the English language (e.g., Anglo-Saxons, Romans/Latin, France, Amelia Bloomer, Olympia)
    - Word exploration worksheets
    - Discussions of the influence of other languages on English
- Word sort identification for vowel length
- Shared and independent writing activities
- Word sorts identifying spelling patterns and word origins
- Identification of spelling patterns within reading and around the classroom
- Identification of spelling patterns within student writing

These activities were adapted and modified from Allcock (2010) and Snowball and Bolton (1999). They were chosen because word study programmes from which they originate discuss incorporation of multiple linguistic components and word origin in small and whole group teaching to promote direct and inquiry learning. This instruction has proven to be effective for diverse learners (see Section 2.4) and fit the learning needs of the students in classroom A. All of the activities included small group, partner and independent work. Each lesson focused on specific learning targets that was shared and discussed with the students as per the New Zealand Curriculum. Discussions of student learning/discoveries occurred before

and after each session. Student learning was monitored with exit tasks (Know, Wonder, Learn worksheets; see Appendix I for student example) and work samples. An overview of the eight sessions, and an example lesson plan with corresponding worksheets is found in Appendix J.

3.5 *Reliability and Trustworthiness*

All probe assessments for the repeated measures of the single-subject case study were re-scored by an independent examiner using the spelling sensitivity scoring system in order to establish inter-rater reliability. An inter-rater reliability percentage of 91.6% was obtained. Consensus was reached between raters to establish the scores to be used for the statistical analysis.

Ten percent of sessions for the small group intervention teaching and the whole group teaching were randomly selected to ensure treatment fidelity of the teaching programme. An independent reviewer examined these sessions and found that each lesson corresponded to the programme described above, and included at least one of the previously described activities (i.e., small group intervention: vowel length identification, morphologically simple or complex word sorts, prompted spelling, and sound cards; Whole group instruction: see Section 3.4.2).

4. Results

4.1 *Statistical Analysis: Repeated measures within the single-subject design*

The celeration line and two-standard-deviation (2SD) band methods were utilised to identify if variation in the percent elements correct score between pre-intervention, and intervention and post-intervention phases were indicative of significant improvement across the phases (Portney & Watkins, 2009).

This analysis was carried out for taught words (i.e., taught words with taught structures; word lists A and B), generalisations (i.e., untaught words with taught structures; word list C) and control words (i.e., untaught words with untaught structures; word lists D, E and F).

The celeration line method involved plotting the trend-line from data collected in the pre-intervention phase using a model described by Portney and Watkins (2009) and extending this trend-line through the intervention and post-intervention phases. A one-tailed binomial distribution probability table (Portney & Watkins, 2009) was used to test whether the intervention and post intervention percent element scores differed significantly from the celeration line forecasted from the pre-intervention data.

The 2SD method firstly involved calculating the mean and standard deviation of the pre-intervention phase. The mean and two standard deviations above and below the mean of the pre-intervention phase are then plotted along the baseline, intervention and post-intervention phases. Scores in the intervention and post-intervention phases are considered significantly different from those achieved in the pre-intervention phase if at least two consecutive data points fall outside of the 2SD band (Portney & Watkins, 2009).

4.2 *Effectiveness of Small Group Intervention*

4.2.1 Results for Repeated Measures Assessments

Effectiveness of the small group intervention on the case study student's spelling skills was measured by analysing the students' results on the taught (i.e., word lists A and B), generalisation (i.e., word list C), and control (i.e., word list D, E and F) repeated assessments. The use of the 2SD band and celebration line methods was not applicable for generalisation words as there was only one probe administered at pre- and post-intervention for this measure.

Student 1's taught words showed significant improvement during the intervention and post-intervention phases with all scores falling above the 2SD band and celeration line (one-tail binomial probability distribution: $n = 8$, $x = 0$, $p = 0.004$; Figure 5). Student 2 also demonstrated significant improvement for taught words during the intervention and post-intervention phases with two consecutive points falling above the 2SD band and celeration line (one-tail binomial probability distribution: $n = 8$, $x = 0$, $p = 0.004$; Figure 6).

Evidence of generalisation of improved spelling skills is reflected in the improvement of generalisation words from baseline to post-intervention for Student 1 (baseline score 73%; post-intervention 91%) and Student 2 (baseline score 65%; post-intervention score 82%).

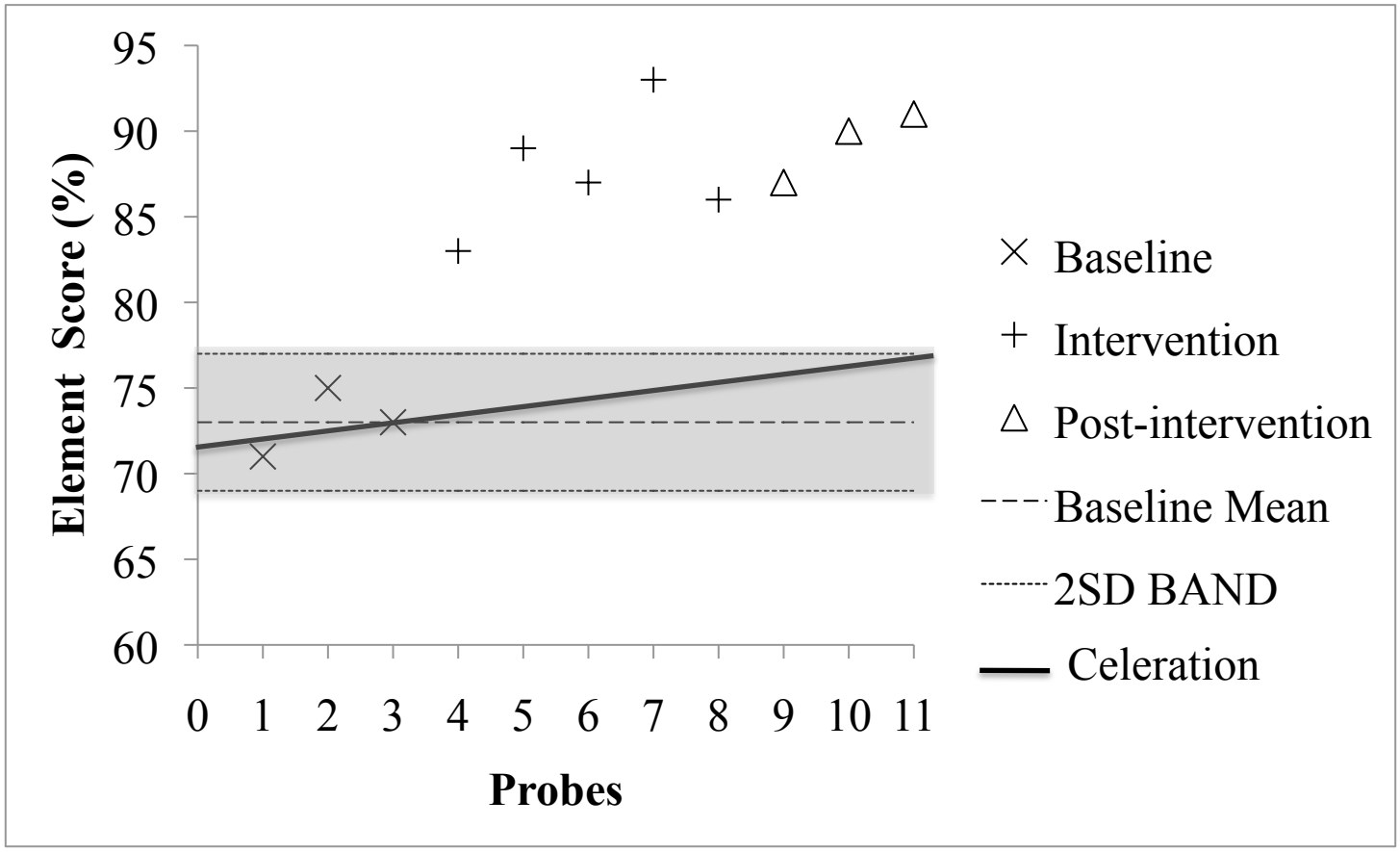

Figure 5. Element scores of probes for words with taught structures (taught words and generalisations) for Student 1 during a single-subject word study intervention. Pre-intervention, intervention and post- intervention scores are depicted along with a celeration line, baseline mean and 2SD band. Data points are raw element percent scores.

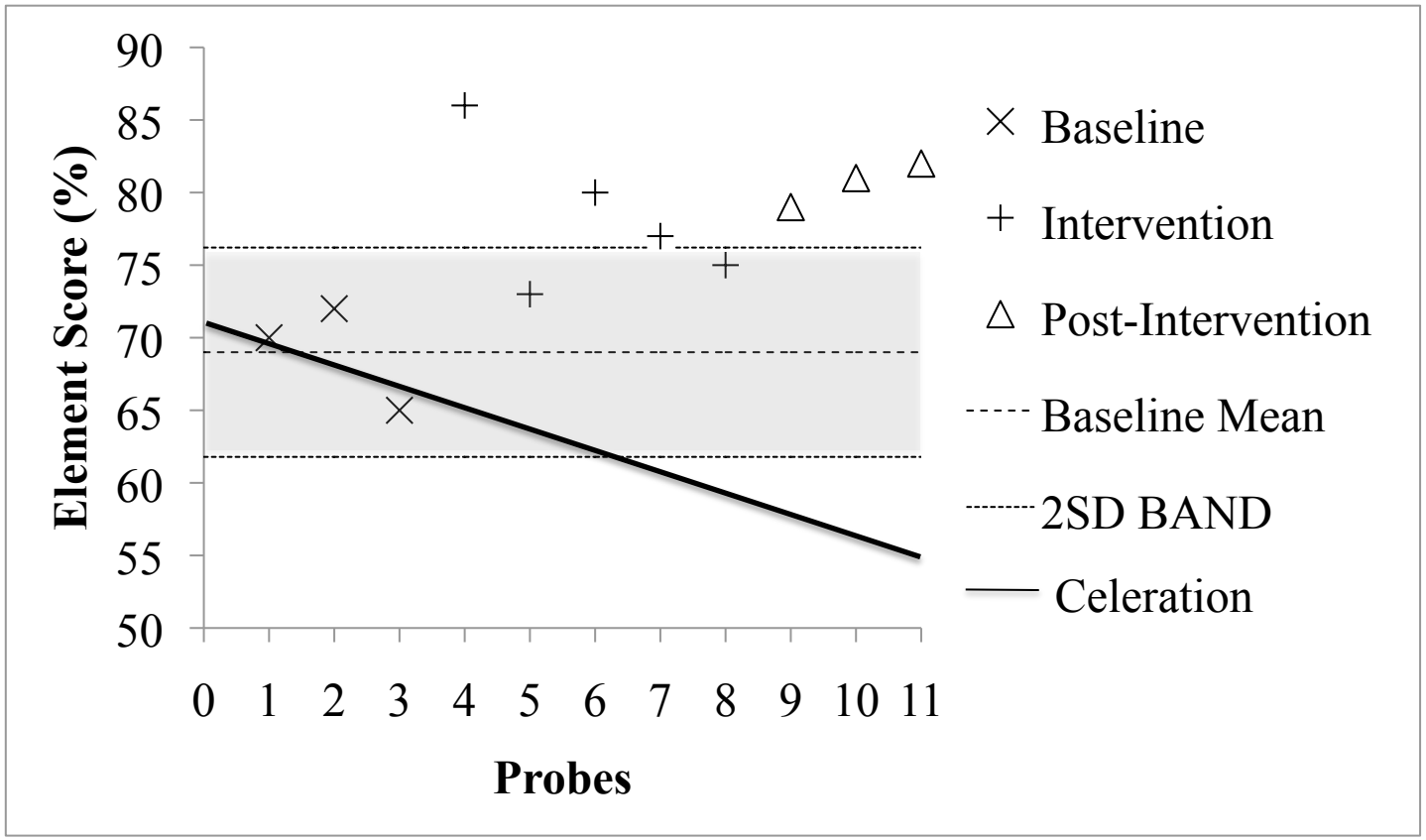

Figure 6. Element scores of probes for words with taught structures (taught words and generalisations) for Student 2 during a single-subject word study intervention. Pre-intervention, intervention and post- intervention scores are depicted along with a celeration line, baseline mean and 2SD band. Data points are raw element percent scores.

For control words (i.e., untaught words with untaught structures), Student 1 exhibited no significant improvement over the baseline and post-intervention phases: mean score baseline of 75.3 ± 2.3%; mean score post-intervention 77.6 ± 8.1% (Figure 7). This implies Student 1 made no change in his spelling of control words over the course of the study. Although all of Student 2's data points for post-intervention fall above the celeration line, because his scores did not correlate with the one-tailed binomial and they all are within the 2SD band, he also displayed no significant improvement for control words: mean baseline score of 67.0 ± 6.0% and a post-intervention mean score of 72.6 ± 2.1% (Figure 8) again denoting no change between baseline and post-intervention probes.

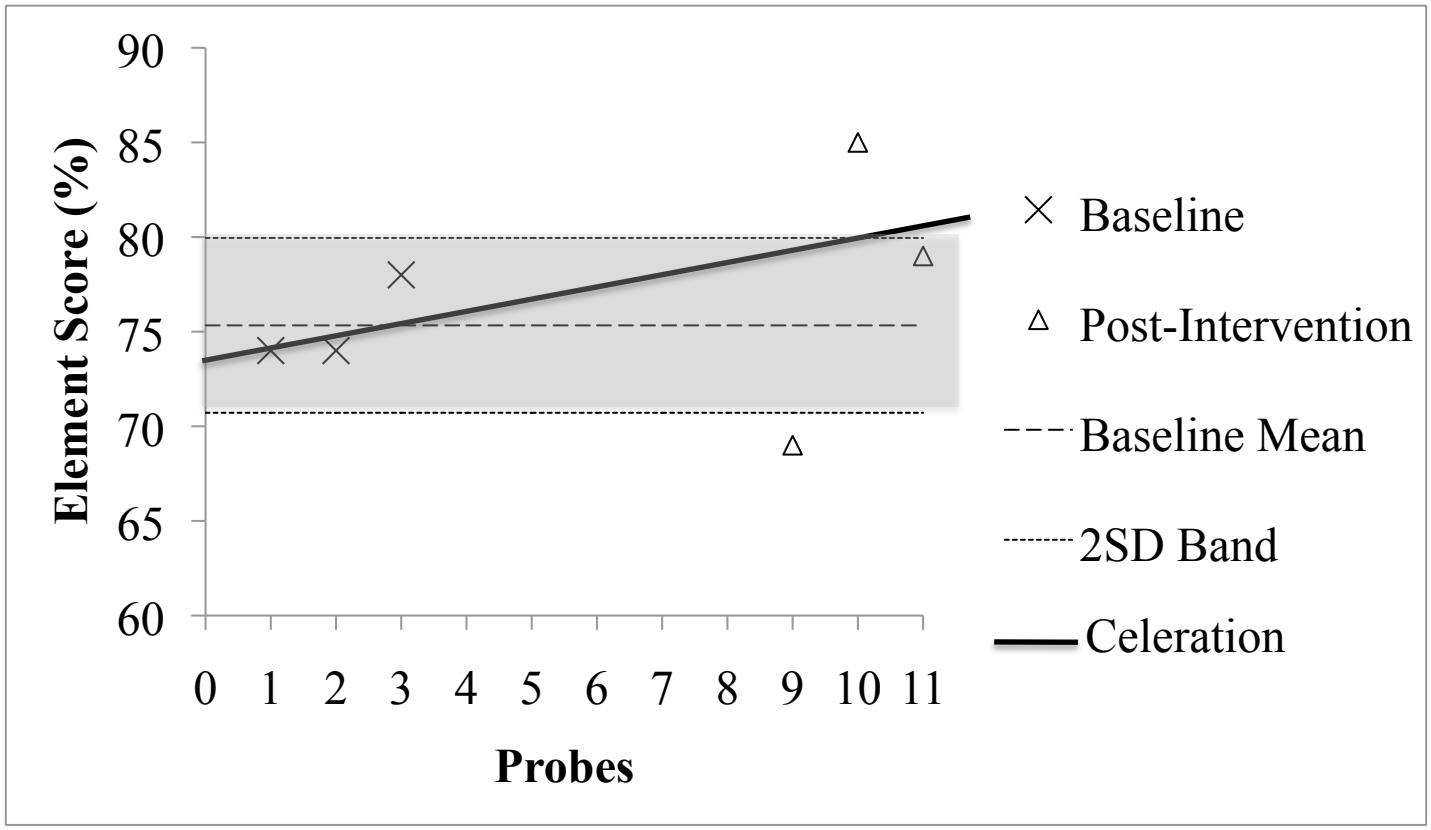

Figure 7. Words with untaught structures (control words) for Student 1's pre-intervention, intervention and post- intervention scores for single-subject word study intervention. Celeration line, baseline mean and 2SD band are depicted. Data points are raw element percent scores.

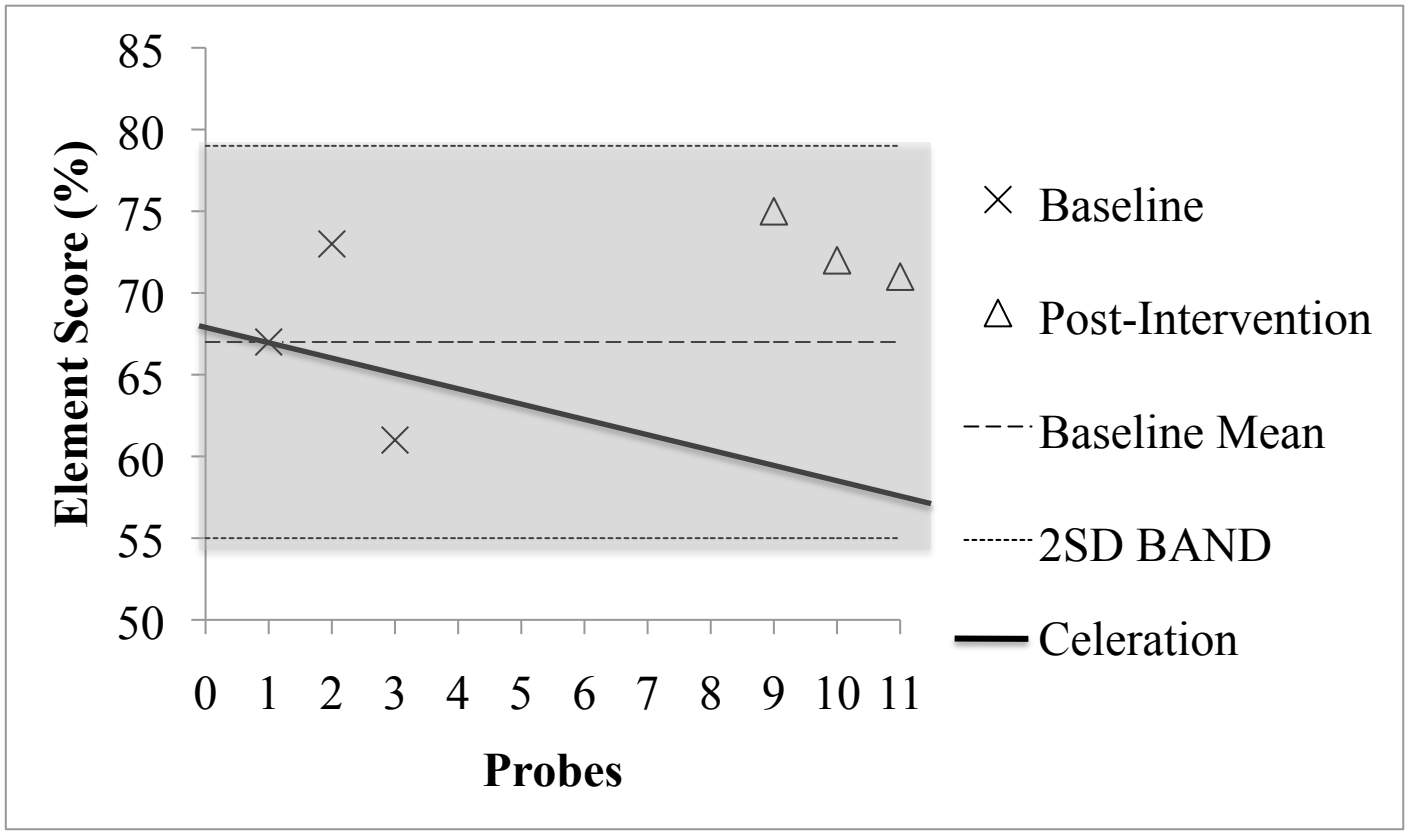

Figure 8. Words with untaught structures (control words) for a Student 2's pre-intervention, intervention and post- intervention scores for single-subject word study intervention. Celeration line, baseline mean and 2SD band are depicted. Data points are raw element percent scores.

4.2.2 Pre-Post Data for Case Study Students

Scores for pre- and post-intervention measures showed varied responses in relation to reading and writing skills (Table 7). Student 1's phoneme detection, BURT, NARA accuracy, TSW-4 SSS, and phonologically transparent and opaque scores improved, while the other literacy measures showed no improvement (Table 7). Conversely, Student 2 showed differing improvement; his non-word spelling, phoneme segmentation, NARA comprehension, BURT, and TSW-4 raw, standard and SSS increased (Table 7).

Table 7. Pre- and Post-intervention scores on assessment measures for word study intervention case study students.

	Student 1		Student 2	
	Pre	Post	Pre	Post
Non-word Spelling Scaled Score	3*	3*	3*	4*
Non-word Reading Scaled Score	3*	3*	3*	3*
Phoneme Detection Scaled Score	4*	8	3*	3*
Phoneme Segmentation Scaled Score	11	10	8	14
Phoneme Manipulation Scaled Score	3*	3*	4*	3*
NARA Accuracy Stanine Score	2*	3*	1*	1*
NARA Comprehension Stanine Score	3*	3*	1*	2*
NARA Rate Stanine Score	5	3*	4	4
BURT Equivalent Age Band	7.11-8.02*	8.04-9.03*	6.06-6.09*	6.09-7.03*
Phonologically Transparent Raw Score	6	7	2	0
Phonologically Opaque Raw Score	2	3	0	0
TSW-4 Raw Score	10	9	3	8
TSW-4 Standard Score	80*	78*	72*	76*
TSW-4 SSS (percent elements correct)	86.7%	87.6%	78.6%	83.7%

Note. Std Score expected range for a student's age is 85-115; Scaled Score expected range for a student's age is 7-13; Stanine Score expected range for a student's age is 4-6; NARA = Neale Analysis of Reading Accuracy; BURT = Burt Word Reading Test; TSW-4 = Test of Written Spelling Fourth Edition; SSS = Spelling Sensitivity Score; Phonologically opaque and phonologically transparent raw scores are a part of the Base Word Detection Task; Raw scores for phonologically transparent and opaque words out of 9 and 7 respectively; SSS of number of elements earned out of total possible number of elements earned; * signifies student scored below expected age range.

4.3 *Statistical Analysis: Whole group comparison*

A two-way repeated measures ANOVA (Portney & Watkins, 2009) was completed for the Kirk and Gillon (2009) Spelling Task, Allcock Pseudoword Task and the Allcock Gap Analysis[5]. Time (i.e., pre-and post-teaching) served as the within subjects variable and teaching (i.e., taught and untaught) served as the between subjects variable. The level of improvement over time of the taught group versus the level of improvement over time of the untaught group (i.e., the interaction between time and teaching) is shown as interaction effect.

4.4 *Effects of Whole Group Comparison*

Students' spelling scores (Table 8) did not significantly change over the course of the intervention with respect to time, teaching, nor the interaction between the two. Results show: Kirk and Gillon 2009 Spelling Task (Time: $F\{1,6\} = 0.10$, $p = 0.70$; Teaching $F\{1,6\}= 4.90$; $p = 0.07$; Interaction Effect: $F\{1,6\} = 0.07$; $p = 0.80$); Allcock Pseudoword Task: Time: $F\{1,6\} = 0.06$; $p = 0.80$; Teaching: $F\{1,6\} = 2.90$; $p = 0.10$; Interaction Effect: $F\{1,6\} = 2.00$; $p = 0.20$); and Allcock Gap Analysis (Time: $F\{1,5\} = 0.06$, $p = 0.80$; Teaching: $F\{1,5\} = 0.30$; $p = 0.60$; Interaction Effect: $F\{1,5\} = 0.40$; $p = 0.50$). This indicates that whole group intervention teaching had no evidence of an effect on the spelling of students' from the experimental group.

[5] Scores for only six students from the untaught group were reported for the Allcock Gap Analysis, for both pre- and post-intervention, as one of the students was absent during the administration of this assessment.

Table 8. Means, standard deviations, minimum and maximum of raw scores for whole group comparison assessments by group (taught and untaught) and pre-and post-teaching

	Taught Group (n = 7)				Untaught Group (n = 7)			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Kirk and Gillon (2009) Spelling Task								
Pre-Teaching	8.7	6.1	0	15	14.3	4.6	5	20
Post-Teaching	9	6.2	0	17	14.9	5.8	4	20
Allcock Pseudoword Spelling Task								
Pre-Teaching	9.6	4.8	2	14	14	3.1	10	20
Post-Teaching	10.4	5.2	3	17	12.7	4.9	4	17
Allcock Gap Analysis[1]								
Pre-Teaching	51.1	34.3	0	95	62	23.6	16	78
Post-Teaching	51.1	31.9	6	97	64.5	17.8	35	90

Note[1]. Only six scores are recorded for Untaught Group for both pre and post teaching on the Allcock Gap Analysis.

5. Discussion

The current study aimed to determine the effectiveness of classroom-wide word study programme in promoting spelling development of 9-year-old students with dyslexia. Two research questions were examined to establish the efficacy of the word study intervention programme: the first investigated the effects of a small group word study intervention programme on the spelling skills of two students with dyslexia, and if there were any noticeable effects on reading abilities as well; the second examined the efficacy of a word origin and multiple linguistic word study programme initiated in a mixed inquiry-based/direct instructional setting at the whole class level. Overall, findings for the word study intervention programme displayed mixed results. Small group intervention resulted in significant improvement in spelling probes for taught words and generalisations (i.e., untaught spelling words with taught structures) for case study students. Students' reading abilities improved, though the extent of this improvement was minimal with most scores remaining below the expected range for the students' age. Whole group specialist teaching, using mixed methods direct/inquiry-based instruction, did not improve spelling of students in the intervention classroom.

5.1 *Small Group Intervention*

5.1.1 Discussion of Results

The first research question explored whether a small group word study intervention applied within a classroom setting improved the spelling of children with dyslexia. As per the phonological theory, the word study programme centred on multiple linguistic skill sets (i.e.,

orthographic knowledge and morphological awareness) as a means to develop and improve spelling abilities. Specific focus was applied to orthographic pattern knowledge in morphologically simple (e.g., *bake, back, patch, peach*) and complex (e.g., *piled, mopping, icy*) words. Results showed significant improvement on spellings of words with taught structures (i.e., probe measures for taught words and generalisations). Student 1 demonstrated most improvement with all intervention and post-intervention scores falling above the 2SD band and celeration line; indicating that Student 1 not only learned taught words from the intervention, but applied orthographic pattern knowledge to similar morphologically simple and complex words. For Student 2, two consecutive points for intervention and three consecutive points for post-intervention scores fell above the 2SD band and celeration line; establishing similar improved abilities to generalise learned orthographic pattern structures as seen in Student 1. As anticipated no significant improvement was noted for spelling of untaught words with untaught structures. This reflects the fact that control probes did not share orthographic or morphological patterns of taught words, and signifies that improvements seen for taught and generalisation spelling probes were due to the intervention and not general maturation of the students. Overall, findings suggest that explicit multiple linguistic instruction within a small group word study programme can significantly improve spelling and generalisation abilities of students with dyslexia.

Further evidence of positive outcomes from explicit multiple linguistic instruction on spelling is displayed in results for standardised spelling assessment (i.e., TWS-4; Larsen, *et al*., 1999). Results for TSW-4 revealed increase in standard score for Student 2 (i.e., from 72 to 76). Although Student 1's standard scores did not increase, Spelling Sensitivity Scores for both

case study students improved slightly (i.e., Student 1 improved from 86.7 to 87.6%, and Student 2 improved from 78.6 to 83.7%), demonstrating retention of patterns and structures that were practised during the intervention. Thus, data lends credence to the efficacy of multiple linguistic interventions for improving spelling of students with dyslexia.

Varied outcomes were apparent for reading and phonological awareness. Post-intervention assessments indicated: improved reading accuracy (i.e., increased stanine score from 2 to 3) and phoneme detection (i.e., increased scaled score from 4 to 8) for Student 1; progressed reading comprehension (i.e., increased stanine score from 1 to 2) and phoneme segmentation (i.e., increased scaled score from 8 to 14) for Student 2; improved word recognition abilities for both students (i.e., as demonstrated from increased equivalent age bands[6]; Student 1 rose from 7.11-8.02 to 8.04-9.03; Student 2 rose from 6.06-6.09 to 6.09-7.03); yet all other reading and phonological awareness measures were unaffected. Results imply student specific improvement in reading and phonological awareness.

Overall, reading and phonological awareness scores remained at or below expected age range with exception to: phoneme segmentation for both students and Student 1's phoneme detection. Several possible explanations exist for the above exceptions. Firstly, above expected age range pre- and post-intervention phoneme segmentation scores for both students likely result from previous learning experiences (e.g., one-on-one intervention, classroom learning, general maturation) rather than from the current intervention. Secondly, although Student 1's phoneme detection improved, it is likely this does not relate to the current

[6] Equivalent age bands written as years and months (e.g., 7.11-8.02 = 7 years 11 months to 8 years 2 months).

intervention as all other scaled scores for phonological awareness remained unaffected. While it is unlikely that the limited improvements seen for reading (excluding word recognition) result from the current intervention, this was to be expected as the current intervention focused on spelling strategies.

5.1.2 Research Implications for Spelling

The spelling improvement seen in response to small group intervention is consistent with previous studies that have revealed positive effects from multiple linguistic interventions on the spelling, particularly orthographic and morphological components, of older children (e.g., Apel & Masterson, 2001; Berninger, *et al*., 2003; Berninger, *et al*., 2008; Kelman & Apel, 2004; Kirk & Gillon, 2009). Similarly to the current study, Kirk and Gillon (2009) found significant improvement in spelling of children (aged between 8 and 11, with non-dyslexia specific poor spelling abilities) after receiving integrated morphological awareness interventions that targeted orthographic patterns in words. Bernigner et al. (2008) also found positive effects on spelling skills for students with dyslexia (9 to 15 years), noting that orthographic and morphological interventions were more effective for older children than phonological awareness.

Orthographic components are frequently included within phonological interventions (e.g., Apel & Masterson, 2001; Gillon & Dodd, 1998; Lovett, Lacerenza, Borden, *et al*., 2000), whereas fewer studies discuss and utilise morphological awareness (Goodwin & Ahn, 2010); of these, most focus on older children and adolescents with dyslexia (e.g., Abbott & Berninger, 1999; Arnbak & Elbro, 2000; Berninger, *et al*., 2003; Berninger, *et al*., 2008; Elbro & Arnbak, 1996; Lovett, Lacerenza, Borden, *et al*., 2000; Lovett & Steinbach, 1997). The relative lack of

research discussing integrated morphological interventions for improving spelling could reflect the notion that children with dyslexia struggle with development of phonological awareness and letter-sound relationships, and accordingly these areas should receive most attention (Tunmer & Chapman, 2006; Tunmer & Greaney, 2010). While some studies have found normal beginning readers and spellers utilise morphological awareness skills (Bourassa, *et al*., 2006; Treiman & Cassar, 1996) this is more prevalent once children have developed moderate phonological abilities (Lyster, 2002).

The effectiveness of multiple linguistic interventions (including morphological awareness) for improving the spelling of older children with dyslexia is thought to be related to the similar literacy profiles of these children and their younger, typically developing, counterparts (Moats, 1983). That is, both groups display a basic level of phoneme awareness that allows them to respond to multiple linguistic interventions that focus on other aspects of metalinguistic awareness (Bourassa & Treiman, 2001). Older children with dyslexia acquire limited phonological skills allowing them to scaffold upon this knowledge to improve other deficient components (i.e., orthographic knowledge and/or morphological awareness) (Bourassa & Treiman, 2003; Bourassa, *et al*., 2006; Masterson & Apel, 2007). Although case study students displayed phonological impairment (as determined by preliminary assessment measures; see Table 7), moderate phoneme abilities were displayed in the spelling attempts at pre-assessment using the Spelling Sensitivity Scores (i.e., spelling attempts generally matched the phonological structure of target words; e.g., *pil* for *pile*, *pech* for *peach*, *bak* for *back*). Thus, case study students' phonemic awareness provided a basal spelling ability, allowing

specific work with orthographic and morphological components to improve spelling and generalisation skills.

While Students 1's probe results displayed greater spelling improvement than Student 2, Student 2's dyslexia was more severe (as demonstrated through the downward slope of celeration line; see Figure 6). Throughout the course of the intervention Student 2 received weekly explicit phonological intervention (i.e., SpeLD NZ training). As previous research suggests that explicit phonological interventions, that include linguistic components, are effective in remediating reading and spelling of students with dyslexia (Gillon, 2004; Gillon & Dodd, 1997, 1998; Hatcher, *et al*., 2004; Lovett, *et al*., 1994; Lovett, Lacerenza, Borden, *et al*., 2000), the improvements seen for Student 2 may be due to this additional intervention. This correlates with previous studies including Gillon and Dodd (1998) where a multiple linguistic intervention was implemented involving a mix of phonological awareness training with linking speech to print followed by semantic/syntactic training of vocabulary. Results prior to intervention showed that the case study child demonstrated difficulties with phonological awareness, word recognition and particularly spelling. Post-intervention results showed improved word recognition and spelling, demonstrating the positive effects of withdrawal phonological awareness intervention plus multi-linguistic components. Accordingly, Student 2's improvement in spelling likely results from the one-on-one intensive phonological awareness training he received in addition to the small group intervention.

The external influence of phonological awareness training is corroborated by increased post-intervention standard scores on TSW-4 spelling assessment for Student 2; Student 1 did not show improvement on standardised spelling. Although Student 1 indicated improved

Spelling Sensitivity Score, Student 2's improvement was greater. Therefore, improvement in Student 2's spelling may be attributed to the one-on-one phonological training he received. This supports previous research showing phonological awareness training for children with severe dyslexia aids development of phonological abilities (Torgesen, 2006; Torgesen, *et al*., 2001; Torgesen, *et al*., 1994), whilst re-confirms positive effects of integrating other linguistic components within interventions (Bourassa & Treiman, 2001).

5.1.3 Research Implications for Reading

Multiple linguistic interventions not only positively affect spelling, but also reading (Apel & Masterson, 2001; Kelman & Apel, 2004). Kelman and Apel's (2004) multiple-linguistic spelling intervention evinced significant improvement in spelling and word level reading for the participant (aged 13 and exhibited poor spelling and reading abilities pre-intervention). The current study corroborates these findings due to increased word recognition for both students.

Word recognition is a common difficulty for people with dyslexia (Gillon & Dodd, 1998; Gough & Tunmer, 1986; Lovett, *et al*., 1994; Lovett & Steinbach, 1997; Lyon, *et al*., 2003; Stanovich, 1992; TKI, 2010; Torgesen, 2006; Tunmer & Greaney, 2010), and is a crucial skill for beginning readers to develop in order to assist with reading acquisition (Gough, Juel, & Griffith, 1992; Seidenberg, 1992). Developmental reading involves both decoding (i.e., a skill set required for word recognition; Kamhi & Catts, 2005) and comprehension (i.e., including listening and reading comprehension; Gough & Tunmer, 1986). Thus, as a phonological deficit limits a child's decoding abilities, word recognition of students with dyslexia is restricted, affecting overall reading acquisition (Gough & Tunmer, 1986). Poor

decoding abilities also affects reading comprehension (Pressley, 2006), explaining why children with dyslexia may exhibit high listening comprehension skills, but retain poor reading comprehension (Tunmer & Chapman, 2006). Therefore, although in the current study both case study students' scores were below expected age range, increased word recognition scores may have influenced other reading areas measured (i.e., comprehension and accuracy). This is shown through Student 2's enhanced reading comprehension, which indicates that improved decoding abilities contribute to better reading comprehension (Pressley, 2006). It is highly likely the extra phonological training Student 2 received over the course of the intervention influenced decoding skills. Similar findings were noted in Torgesen *et al*. (2001) which examined the outcomes of two different instructional approaches: 1) a phonemic sequencing programme for reading, spelling and speech, and 2) an embedded phonemic awareness programme that integrated phonological awareness skills with reading, writing and spelling activities. These interventions were employed using explicit one-to-one direct instruction on children with severe dyslexia between 8 and 10 years of age. Both intervention methods longitudinally and immediately improved students' phonemic awareness and overall reading ability, including comprehension. Thus, the current study supports previous research indicating improvement in comprehension for children with severe dyslexia due to phonological interventions integrated with multiple linguistic components (Alexander, *et al*., 1991; Lovett, *et al*., 1994; Torgesen, *et al*., 2001).

Intervention studies for children with dyslexia that incorporate phonological awareness with other linguistic components (i.e., orthographic knowledge and/or morphological awareness) reveal improved phonological processing, letter-sound abilities, word attack and

recognition, as well as other reading skills (i.e., including reading comprehension and fluency) (Carlisle, 1987; Elbro & Arnbak, 1996; Goodwin & Ahn, 2010; Lovett, Lacerenza, Borden, *et al*., 2000; Schneider, *et al*., 2000; Siegel, 2008; Torgesen, 2006; Torgesen, *et al*., 2001; Torgesen, *et al*., 1994). These results mirror improvements demonstrated here for Student 2 (see Section 5.1.1). Conversely, Student 1 did not receive extra phonological treatment yet still displayed moderate levels of reading improvement. This suggests metalinguistic abilities may influence reading acquisition (Casalis, *et al*., 2004). Regardless, improvements demonstrated for reading were minimal highlighting possible limitations of the current intervention.

5.1.4 Research Implications for Intervention Design

Most interventions for dyslexia utilise one-on-one or small group instruction (i.e., four students or less; with exceptions to Berninger, *et al*., 2008) and take place outside regular classroom teaching (Kirk & Gillon, 2009). This is primarily due to evidence that withdrawal (i.e., outside classroom learning) interventions successfully remediate deficits in students with dyslexia by providing opportunities to work on specific skills in an intensive setting (Torgesen, 2004). However other research identifies various factors contributing to children's lack of retention of these skills longitudinally including: duration of intervention, lack of transition to classroom (i.e., skills students acquired in intervention are not practised within the classroom setting), severity of the child's disability, method of intervention (i.e., skill sets and activities that were practised), treatment resistors (i.e., children whom the method of intervention did not suit their specific needs), measures used to assess students' abilities (e.g., text reading accuracy versus word reading accuracy), and general lack of acquisition from participants (Torgesen, 2006). Unlike previous studies, small group intervention (i.e., eight students) employed here

was integrated within regular classroom teaching and designed to fit with the classroom's reading programme. Although incorporating interventions within the classroom does not account for all factors of longitudinal effects, it builds learning connections for children both in and outside class as well as allows children to practise and extend newly learned skills. The effectiveness of integrating interventions within the classroom is evidenced from significant improvement in spelling probes seen here.

However, results for reading did not share the same enhancement (i.e., improvement was less evident). While this reveals the fallibility of certain aspects of integrated classroom intervention, the duration of the current study must be considered as it was shorter than previous withdrawal studies (Abbott & Berninger, 1999; Apel & Masterson, 2001; Berninger, *et al*., 2003; Bourassa & Treiman, 2001; Lovett, *et al*., 1994; Torgesen, 2006; Torgesen, *et al*., 1994), and focused more on word study (i.e., spelling and relating it to text) rather than reading and phonologically based activities. Longer interventions and interventions including reading and phonological activities may recreate positive results observed in other multiple linguistic word study interventions (Apel & Masterson, 2001; Kelman & Apel, 2004; Kirk & Gillon, 2009).

Children with dyslexia need ongoing support in phonological, orthographic and morphological components to continue to develop spelling and word recognition. While small group word study intervention could be modified to include more phonological activities to support linguistic connections, it is the intensity of withdrawal interventions that allow students to acquire the strategies they need for reading and spelling in a condensed timeframe (Torgesen, 2004). Integrated classroom interventions are not infallible in that they are

dependent upon needs of various classroom students, location and time allotted for small group reading, students' engagement, and acquisition of skills and strategies. However, as demonstrated through Student 2's results, when used in tandem with withdrawal interventions small group multiple linguistic training can offer classroom-based learning opportunities for students with dyslexia, particularly severe dyslexia, to scaffold and enhance learning.

5.2 *Whole Group Intervention*

5.2.1 Discussion of Results

The second research question examined the effects of a whole group word study intervention programme on the spelling skills of students in the intervention classroom. The word study programme enacted here utilised direct (i.e., specific skill work for students) and inquiry-based (i.e., student exploration of words in their environment) instruction whilst integrating the study of word origins and multiple linguistic components. Results indicated no significant change between spelling abilities of the two groups, signifying whole group intervention had no impact compared to regular spelling instruction.

5.2.2 Research Implications

While word study intervention for whole groups has not been well explored (Harris, *et al*., 2011), those studies undertaken suggest positive improvement for students with and without dyslexia (Butyniec-Thomas & Woloshyn, 1997; Harris, *et al*., 2011; Henry, 1987, 1988; Roberts Frank, 2008; Robinson & Hesse, 1981). Unlike previous research, which verifies positive effects of incorporating word origins and multiple linguistic skill sets on spelling (Abbott & Berninger, 1999; Henry, 1988, 1997, 1998, 2010; Henry, *et al*., 1989; Joshi,

et al., 2008; Moats, 1995, 2000, 2005; Treiman, 1993), the whole group intervention performed here had no effect.

Several alternative explanations may account for the apparent lack of significant improvement in spelling skills. First, absence of one student from the control classroom (i.e., Classroom B) on one of the post-intervention assessments (see Section 4.4) may have impacted data analysis. Although it is unlikely that this would account for the non-significance of the results, it is important to note as a possible contributing factor. Second, both the whole group intervention class (i.e., classroom A) and the control class (i.e., classroom B) were being taught the direct instructional spelling programme *Spelling Under Scrutiny* (Allcock, 2010) throughout the course of the intervention. While results do not coincide with findings of previous word study research (Joshi, *et al*., 2008; Moats, 2000, 2005; Treiman, 1993; Williams, 2009), the use of two contrasting spelling programmes (i.e., the current intervention and *Spelling Under Scrutiny*) may have influenced results. The lack of effect seen is similar to Henry (1987) where no significant improvements were noted between two different word study programmes (i.e., word study plus explicit decoding and word study plus implicit decoding). Both whole class programmes were found to be more effective than no spelling instruction; however this does not serve as a direct comparison to the current study as control students were receiving formalised spelling training. Third, it has been widely recommended that word study be utilised daily within classroom learning and incorporated within reading, writing and spelling activities (Williams, 2009). Though studies are limited, sessions of whole group word study interventions for older students (e.g., Harris, *et al*., 2011; Henry, 1987; Roberts Frank, 2008) were more frequent (i.e., at least 2 days/week), thus ensuring multiple classroom

opportunities to practise newly acquired skills. The current whole group intervention occurred once a week, therefore learning opportunities for students were limited. Wider incorporation within the classroom curriculum and more frequent instruction may improve the efficacy of the intervention outlined here. Finally, whole group studies typically range between 45 minutes/session for 10 sessions (i.e., total of 7.5 hours) (Harris, *et al*., 2011) and 20 minutes/session for 43 sessions (i.e., total of 14.3 hours) (Roberts Frank, 2008). A total of 8 hours of word study instruction (i.e., 60 minutes/session for 8 weeks) was completed over the duration of the study. This is less than Henry (1987) (i.e., 30 to 40 minutes/session for 25 sessions) and other whole class studies that have found positive effects (e.g., Roberts Frank, 2008; Robinson & Hesse, 1981), as well as one-on-one interventions that have utilised similar instructional methods (Abbott & Berninger, 1999; Apel & Masterson, 2001; Kelman & Apel, 2004). While Harris *et al*. (2011) identified improved word knowledge and morphological awareness over a shorter duration, participants were much older than those in the current study potentially allowing them to process information more quickly. Thus, when comparing effects seen in the current study to other research, duration of intervention must be taken into account.

Consistent with several previous studies the lack of an effect seen here for the whole group intervention likely stems from the short duration of the study. For example while Henry (1987) found improvement in word structure knowledge of learning-disabled students (Years 3-6), who participated in word study and explicit decoding interventions, it was noted that interventions should be lengthened to provide more exposure to concepts and to enhance understanding. Similarly, when examining high school students with learning and non-learning disabilities, Harris and colleagues (2011) found improvement in students' word analysis and

vocabulary when applying word study instruction focusing on word strategies to whole group teaching. Nevertheless, they too commented that duration of intervention (i.e., 10 sessions; 2 sessions/week; 45minutes/session; 7.5 hours total) did not offer enough time for students to fully acquire skill sets. Therefore, limitations of duration in the current study coincide with previous explanations of limited effects in whole group word study research, indicating the need for longer intervention time to promote learning connections for students with learning disabilities and dyslexia.

5.3 *Theoretical Implications*

The current study contributes to the increasing evidence of the impact of multiple linguistic interventions on children with dyslexia (Apel, *et al*., 2004; Bourassa & Treiman, 2001; Moats, 1995), and serves as a gateway for future examinations of the effects of spelling interventions incorporated within the classroom. Both case study students exhibited significant improvement in spelling probes (i.e., taught and generalisation), demonstrating abilities to generalise words that shared similar structures to those taught during the intervention. Further confirming the importance of explicitly teaching spelling patterns to students (Abbott & Berninger, 1999; Allcock, 2010; Treiman, 1993; Treiman & Bourassa, 2000).

Previous research demonstrates that students with severe dyslexia require additional assistance with phonological awareness (Torgesen, *et al*., 2001). As previously mentioned (see Section 5.1.2), the improvements seen in Student 2's spelling over the course of the intervention may be attributable to the extra phonological awareness training he received. This finding may signify three things: first, one-on-one student support is needed for children with

severe dyslexia; second, one-on-one interventions can be used in association with classroom interventions; and finally, it corroborates research that suggests multiple linguistic interventions improve spelling skills of students with dyslexia (Bourassa & Treiman, 2001; Kirk & Gillon, 2009; Masterson & Apel, 2007, 2010; Moats, 2000).

Although this study did not corroborate positive effects previously noted for whole group word study programmes (e.g., Harris, *et al*., 2011; Henry, 1987, 1988; Henry, *et al*., 1989; Roberts Frank, 2008), many of these studies pertain to intermediate and high school students (with exceptions to: Butyniec-Thomas & Woloshyn, 1997; Henry, 1987) and do not specifically focus on spelling. Thus, the current study contributes to word study research as it has examined the spelling of older primary students (i.e., 9-years of age) and elucidates the need for further investigation in this area.

Most importantly, findings add to current theories of dyslexia. In alignment with research in this area, intensive phonological awareness interventions that include letter-sound knowledge have proven to remediate early literacy development in children with dyslexia (Gillon & Dodd, 1998; Hatcher, *et al*., 2004; Lovett, *et al*., 1994; Torgesen, *et al*., 2001; Vellutino, *et al*., 2008). However, older children with dyslexia typically respond better to interventions that integrate multiple linguistic components (i.e., orthographic knowledge and morphological awareness) (Berninger, *et al*., 2008; Lovett, Lacerenza, Borden, *et al*., 2000; Moats, 1995). This is because students' gradual development of phonological skills allows deficits in other linguistic areas to become apparent. The interdependent relationship between multiple linguistic sources (i.e., phonological, orthographic and morphological abilities) (Berninger, *et al*., 2010; Roman, *et al*., 2009) enables such intervention to specifically target

students' spelling needs whilst scaffolding upon previous knowledge (Masterson & Apel, 2007). While one-on-one and small group multiple linguistic interventions outside the classroom have successfully remediated spelling abilities of students with dyslexia (Abbott & Berninger, 1999; Arnbak & Elbro, 2000; Berninger, *et al*., 2008; Casalis, *et al*., 2004; Elbro & Arnbak, 1996; Lovett & Steinbach, 1997), limited research exists discussing the integration of these interventions within classroom learning. The current study contributes to this knowledge gap by demonstrating positive effects for spelling and generalisation abilities, alluding to the effectiveness of multiple linguistic interventions within classroom learning.

The current study reaffirms previous research showing that, by focusing on students' deficits, one-on-one interventions provide effectual and intensive learning environments for students with dyslexia (Lovett, *et al*., 1994; Torgesen, 2004, 2006; Torgesen, *et al*., 2001). However, the current study goes further as it suggests classroom interventions can offer additional support alongside intensive phonological training (see Section 5.1.4). Acquisition of multiple linguistic components relies on the interdependence of phonological, orthographic and morphological abilities (Berninger, *et al*., 2010; Roman, *et al*., 2009). Thus, the current study highlights the effectiveness of providing classroom-based interventions that specifically target these areas in order to support students with severe dyslexia by fostering the connections between linguistic elements. Accordingly, children receive the one-on-one intensive support they need whilst furthering linguistic connections within classroom learning.

Overall, the current study supports use of multiple linguistic interventions (i.e., phonological awareness, orthographic knowledge and morphological awareness) as per the phonological theory. Similarly to this theory, other theories of dyslexia (e.g., biological and

cognitive) generally agree a deficit in phonological awareness is prominent in people with reading disabilities (Hautus, *et al*., 2003; Ramus, Rosen, *et al*., 2003; Snowling, 1998). Interventions designed from theories that do not stem directly from the phonological-core deficit hypothesis, yet contain some phonological elements, tend to result in significant improvements in phonological and/or reading abilities (e.g., Reynolds, Nicolson, & Hambly, 2003; Tallal, Merzenich, Miller, & Jenkins, 1998); suggesting deficits in phonological awareness are common to the dyslexic syndrome. While not ruling out the importance of other linguistic elements, the current study supports the phonological core deficit hypothesis through the improvements seen in spelling due to multiple linguistic interventions.

5.4 *Practical Implications*

The current word study intervention programme indicated mixed outcomes for integration within classroom instruction. While further research is needed to determine longitudinal effects, overall, the small group intervention successfully improved spelling skills of older children with dyslexia. More importantly, findings demonstrate the feasibility of integrating word study within regular classroom teaching whilst meeting curriculum standards and expectations. This study also demonstrates positive effects of one-on-one and classroom-based interventions used in conjunction to allow students with dyslexia to utilise learned intervention skills within classroom learning.

The limited effectiveness of whole group teaching may result from the short duration of the intervention (i.e., totalling 8 hours). Longer instruction time may reveal a positive effect on student spelling. Whilst only further examination of this can determine accuracy of this

explanation, whole group word study instruction should not be disregarded, nor should these results be used as a deterrent against utilising word study in the classroom. Though limited studies exist investigating whole group word study instruction, most studies integrating word origin and multiple linguistic components studies note positive effects, resulting in development of numerous spelling programmes. Therefore, it is crucial to re-examine the whole group instruction used here to fully understand its practicality as a method of spelling instruction within the classroom.

This study highlights the importance of examining student spelling in order to structure teaching (i.e., lesson planning) and monitor student learning. Researchers attest that students' spelling can offer insight into their knowledge of specific linguistic components (i.e., phonological awareness, orthographic knowledge, and morphological awareness) (Apel, 2011; Masterson & Apel, 2007; Moats, 2000; Treiman, 1993). Therefore, the Spelling Sensitivity Scoring System allows teachers to more closely examine students' spelling abilities (Masterson & Apel, 2010) and adjust instruction accordingly. The use of this sensitive scoring system within the current study allowed investigation of errors consistently made by students, and directed teaching towards specific inaccuracies. This scoring system also successfully monitored student learning and acquisition of taught patterns and structures over the course of the intervention.

Along with utilising a more sensitive scoring system to evaluate student learning, it is essential to implement controlled assessments to determine whether improvement in students' spelling is due to intervention/instruction or general maturation. The use of taught, generalisation and control probes allowed the author to investigate teaching methods and

determine the effectiveness of the intervention on student learning. Implementing probes of taught words as well as probes of generalisations (i.e., untaught words with similar taught structures) allows for direct comparison between probes in order to determine whether students are generalising learned rules to new words. Utilising a control probe list (i.e., untaught words with untaught structures) provides insight into whether student improvement is due to general maturation or classroom instruction. Thus, teachers are able to inquire into the effectiveness of teaching methods and their effects of student acquisition. Inquiry into teaching and learning methods is a crucial component of effective teaching practise in the New Zealand Curriculum (Ministry of Education, 2007). It is a process that requires teachers to re-examine teaching methods, ensuring they are evidence based and effectively promote student learning (Ministry of Education, 2007). Therefore, assessments used in the intervention allow teachers to scrutinize the effectiveness of teaching practises on students' spelling and generalisation abilities.

Overall, this study emphasises the opportunity for students' with dyslexia to learn alongside peers whilst receiving intervention support for specific spelling needs.

5.5 *Limitations*

The short duration of the study likely resulted in the minimal improvements seen in certain areas for students' with dyslexia, particularly reading abilities. A more extended intervention period may result in a greater enhancement of students' spelling and reading. Also, as small group interventions did not include semantic or syntactic skill sets it is possible that lengthier intervention would allow for the introduction and application of these skills.

The intent of the single-subject design was to allow students to serve as their own controls. While this has proven effective in previous research (Portney & Watkins, 2009), the use of three baseline measures applied here in the pre-intervention phase created difficulties with assessing improvement; thus, limiting analysis of improvements in students abilities (i.e., the slope of celeration line). An experimental design incorporating a longer baseline assessment period with more baseline measures should improve statistical power of data generated.

Time constraints prevented a follow-up assessment period to determine the longitudinal effects of the specialty teaching (i.e., word study intervention). Future studies may choose to examine these effects in order to ascertain overall effectiveness of intervention.

The use of a single-word list for generalisation probe words made it difficult to graph students' improvements in generalising these words. This could be remedied by the inclusion of several alternative probe lists for generalisations.

Finally, regarding whole group instruction, while the word study programme used for specialty whole group teaching was ineffective it is possible that the other spelling programme being implemented in the classroom (i.e., *Spelling Under Scrutiny*) may have contributed to students' spelling knowledge. This aspect of the research design was beyond the author's control. Subsequent research with inquiry-based/direct instruction used in a combined word origins and multiple linguistic word study programme should include alternative classes who are not receiving any specialised spelling instruction.

5.6 *Future Directions*

Although findings only partially supported the research questions, attention is drawn to opportunities for future research and practical use within the classroom. This study may promote extended research of dyslexia, especially methods of including multiple linguistic interventions within classroom instruction. To re-examine effects of word recognition and other reading abilities, future research should focus on longer study durations. This applies to whole group specialty teaching as well to fully resolve effects on student spelling. Further investigation should also involve longitudinal effects of the intervention used here.

This study provides support for the first research question, demonstrating the effectiveness of word study interventions in improving spelling of children with dyslexia, with limited effects on reading. While further research is needed to fully elucidate the effects of integrating an effective whole group word study programme (i.e., the second research question), it suggests an alternative to spelling instruction other than rote memorisation. Overall, data supports the positive impact of multiple linguistic interventions on spelling for children with dyslexia, as well as the practicality of integrating word study within classroom learning.

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Appendix A: Full list of repeated measures used

Words with Taught Structures			Words with Untaught Structures		
Word List A	Word List B	Word List C	Word List D	Word List E	Word List F
Patch	Catch	Retch	Weaken	Flatten	Harden
Peach	Teach	Reach	Sunnier	Runnier	Funnier
Hug	Mug	Jug	Dirtiest	Silliest	Bossiest
Huge	Sludge	Judge	Whitish	Littlish	Stylish
Choke	Flake	Trike	Sweetish	Coldish	Warmish
Chock	Flick	Trick	Shapely	Slowly	Thickly
Moping	Loping	Robing	Tidily	Grumpily	Crazily
Mopping	Popping	Robbing			
Hazy	Crazy	Lazy			
Flabby	Sloppy	Floppy			
Icy	Pricy	Spicy			
Striped	Piled	Filed			
Stripped	Pilled	Filled			

Appendix B: Example of weekly overview for small group teaching programme

Small Group Reading Plan Week 6

Theme: Food

Small Group: [*Insert list of participating small group students*]

Materials for Week: School Journal 1997 Number 2 Part 2; Word Sorts; sound cards; pencils and pens; writing paper

Assessment: Monitoring student understanding with thumbs up/down; checking with students independently on vowel sounds; self-assessment check off sheet, spelling assessment (i.e., intervention repeated measure)

	Monday	Tuesday	Wednesday
Reading Activity	*What type of text is this?* *Students group read "The First Pavlova"	No Reading	*What type of text is this?* *Partner read "Pavlova Queen" *Answer comp. questions: E.g.: *Were we right about where Colin was hiding and what happened to the family?* *What do you think will happen to Fridge-Rex?*
Spelling Intervention Activity	*Review of consonants Sound cards – comparing long vowels to short vowels (changing short to long) *Group Practise (speed points) *Prompted Spelling – 4 students at a time. *Word Sort *Partner Practise	*Short/Long Vowel Word Sorts *Prompted Spelling	*Spelling Assessment *Story Writing – alternative ending to Fridge Rex *Partner Sound cards/practicing spelling *Underlining rhyming words in Mrs. Midge's Fridge.
Materials Needed	*Sound cards and vocab lists *Pencil/pen *Spelling Practise Sheet	*School Journal "Fridge-Rex 3000" *Writing Paper and Pencil/pen	*School Journal "Fridge-Rex 3000" *Writing Paper and Pencil/pen

	*New Point Chart	*Sound Cards and Vocab lists	*Sound Cards and Vocab lists *Assessment Sheets
Reading WALT	*We are learning to use personal experience to make meaning from texts.		*We are learning to use personal experience to make meaning from texts.
Spelling Intervention WALT	*We are learning to identify and sort morphologically simple words.	*We are learning to identify long and sort long and short vowels and certain patterns we see. *We are learning to identify patterns in morphologically complex words.	*We are learning to identify long and sort long and short vowels and certain patterns we see. *We are learning to identify patterns in morphologically complex words.

Appendix C: Sample sound card practise sheet

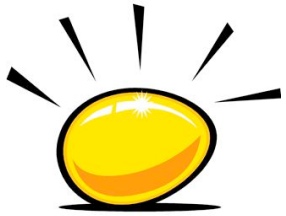
Sound Cards Word Practise List Week 8

Short Vowels	Long Vowels
Hedge	Huge
Catch	Teach
Tack	Take
Flick	Flake
Flicked	Flaked
Chock	Choke
Lick	Like
Licked	Liked
Prick	Price
Pricking	Pricing
Strip	Stripe
Stripped	Striped
Pill	Pile
Pilled	Piled
Mop	Mope
Mopping	Moping
Flab	Haze
Flabby	Hazy
Slop	Craze
Sloppy	Crazy
	Icy
	Pricy

Appendix D: Short vowel identification sheet

A E I O U

cAtch



Egg

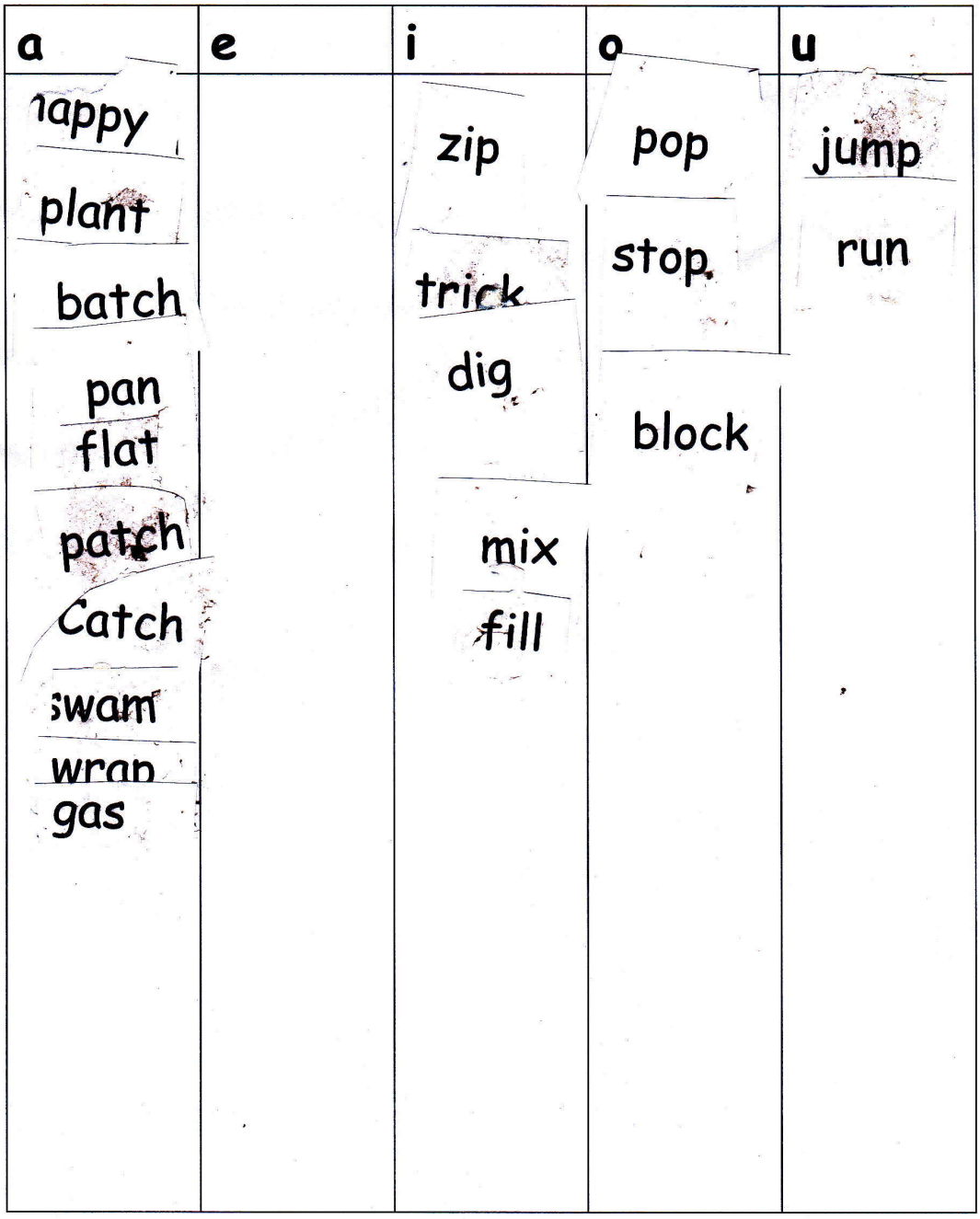
flIck

mOp

hUg

Appendix E: Student example of vowel length identification

Short Vowel Length Word Sort



a	e	i	o	u
ıappy		zip	pop	jump
plant			stop	run
batch		trick		
pan		dig		
flat			block	
patch		mix		
Catch		fill		
;wam				
wrap				
gas				

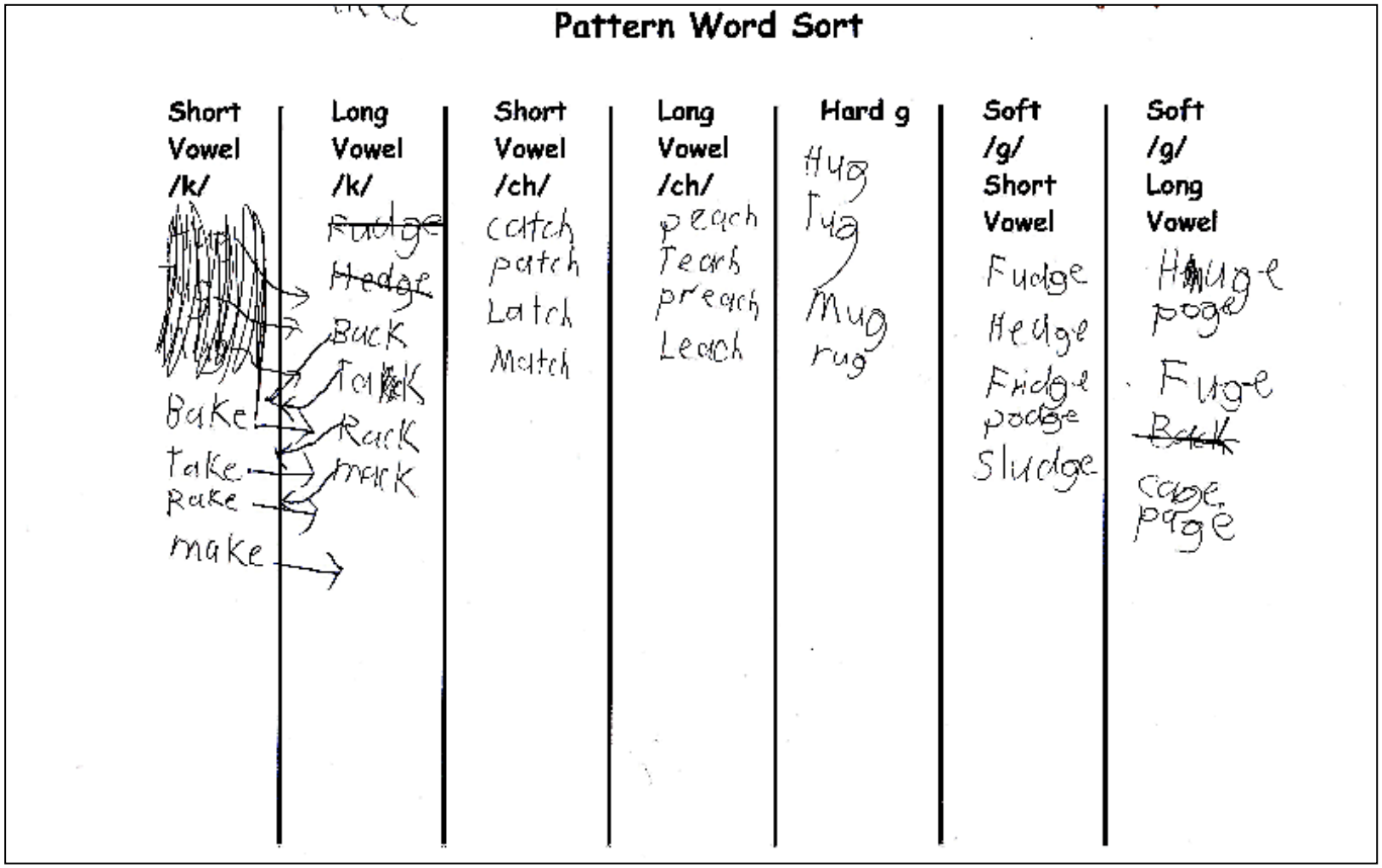
Long Vowel Length Word Sort

Vowel Sort

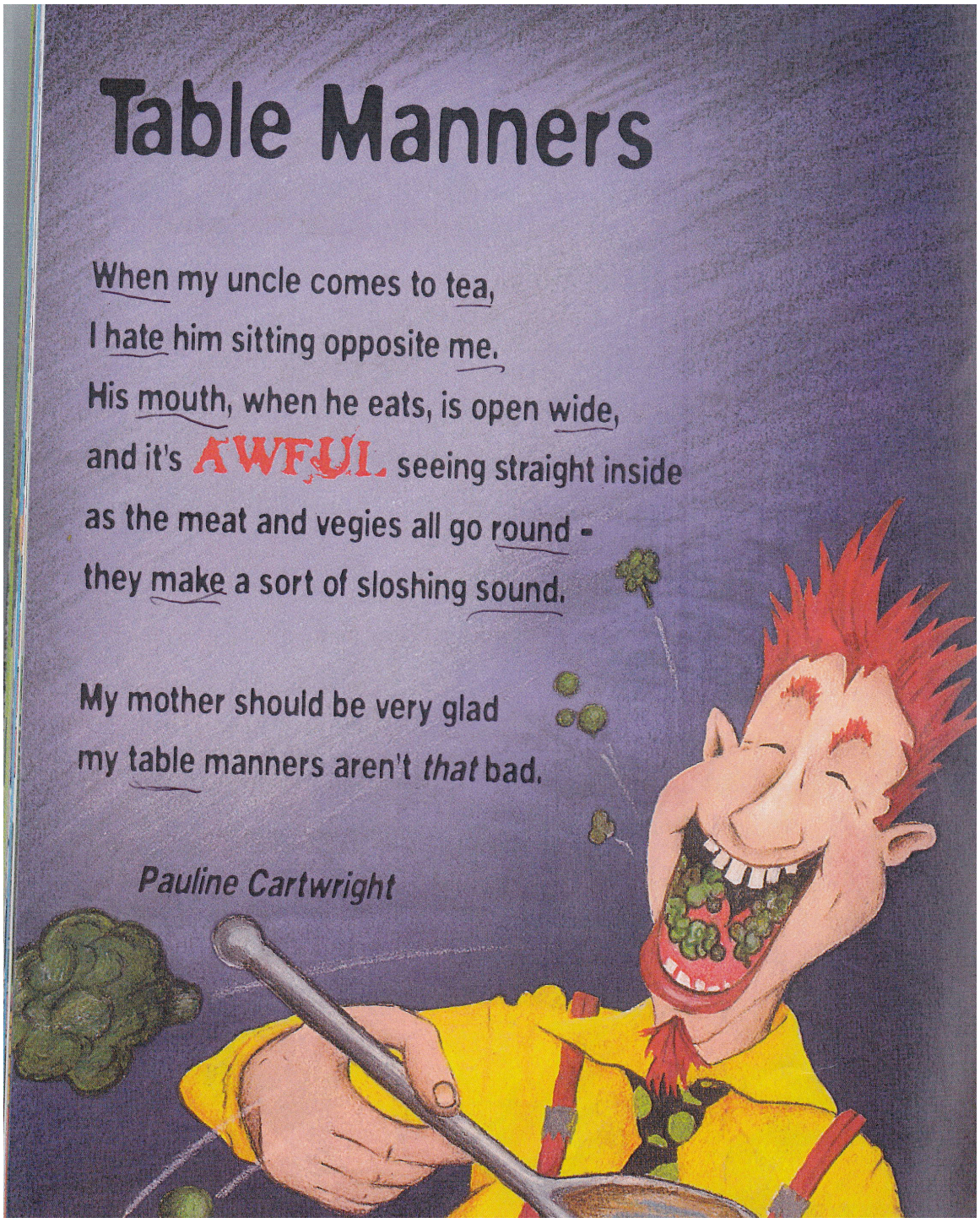
*Sort the long vowels you underlined above into these columns. If you found any long vowels that aren't a_e or i_e put them in the Other box.

a_e	i_e	Other long vowels
~~Chase~~	likes	Tascon
bake	like	Say
make	Shines	~~Pate~~
take	ice	~~Travel~~
~~Face~~	Smiles	~~race~~
Pak	price	~~Back~~
race	prime	
	nice	
	life	
	~~face~~	

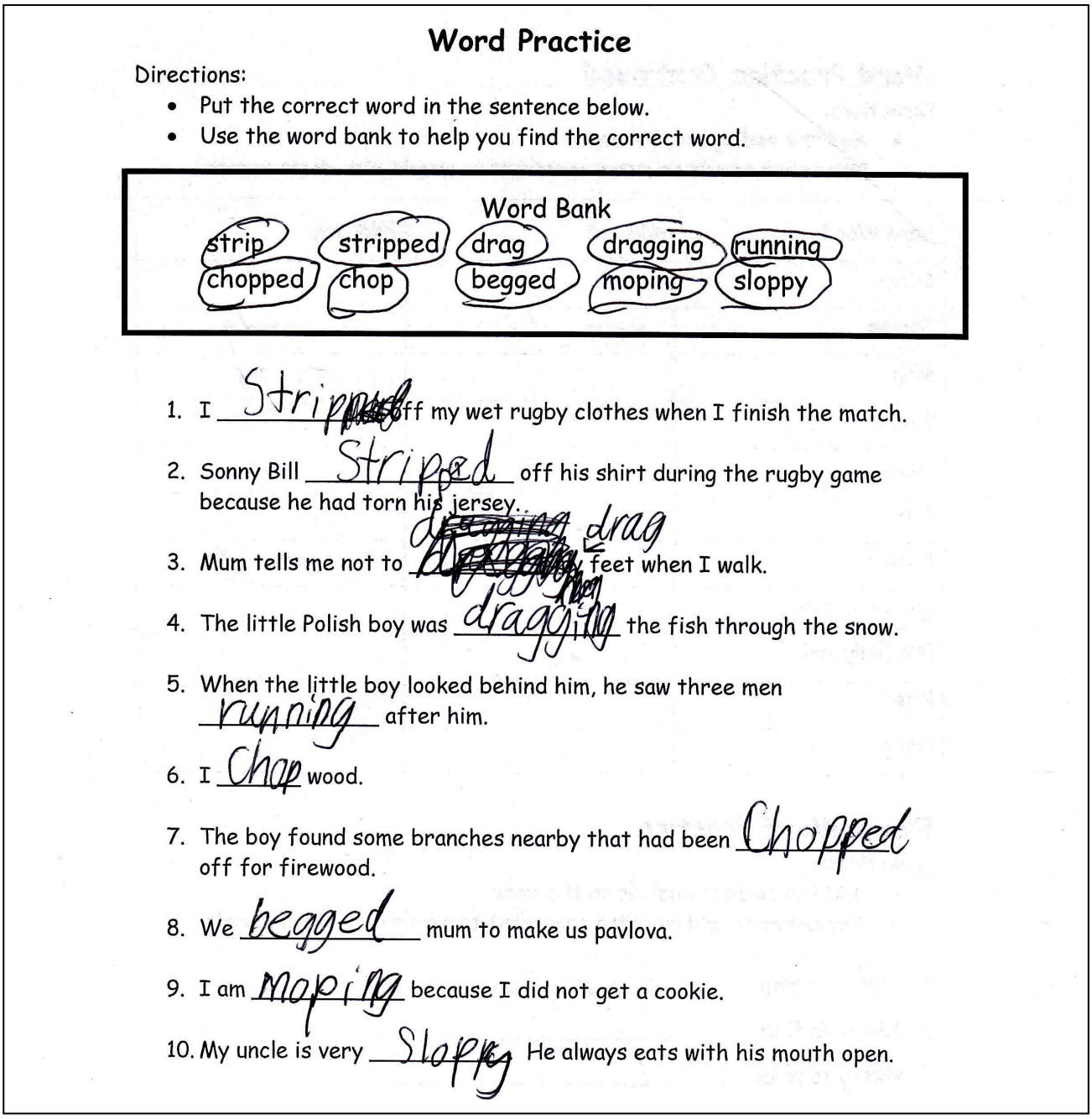
Appendix F: Student example of morphologically simple word sort



Appendix G: Student example of identifying vowel length within text



Appendix H: Student example of morphologically complex word sort



Word Practice

Directions:

- Put the correct word in the sentence below.
- Use the word bank to help you find the correct word.

Word Bank

strip, stripped, drag, dragging, running, chopped, chop, begged, moping, sloppy

1. I Stripped off my wet rugby clothes when I finish the match.
2. Sonny Bill Striped off his shirt during the rugby game because he had torn his jersey.
3. Mum tells me not to drag my feet when I walk.
4. The little Polish boy was dragging the fish through the snow.
5. When the little boy looked behind him, he saw three men running after him.
6. I Chop wood.
7. The boy found some branches nearby that had been Chopped off for firewood.
8. We begged mum to make us pavlova.
9. I am moping because I did not get a cookie.
10. My uncle is very Sloppy He always eats with his mouth open.

Word Practice Continued

Directions:

- Add the endings to the words
- Remember to add an extra consonant to words with short vowels

Base Word	add -ed	add -ing
Strip	Stripped	Stripping
Stripe	Striped	Striping
Mop	mopped	Mopping
Mope	Moped	moping
Lope	Loped	Loping
Pop	Popped	Poping
Chop	Chopped	Chaping
Pill (only -ed)	Pilled	
Pile (only -ed)	Piled	
Prick	pricked	priceing
Price	priced	Pricing

Extra Word Practice

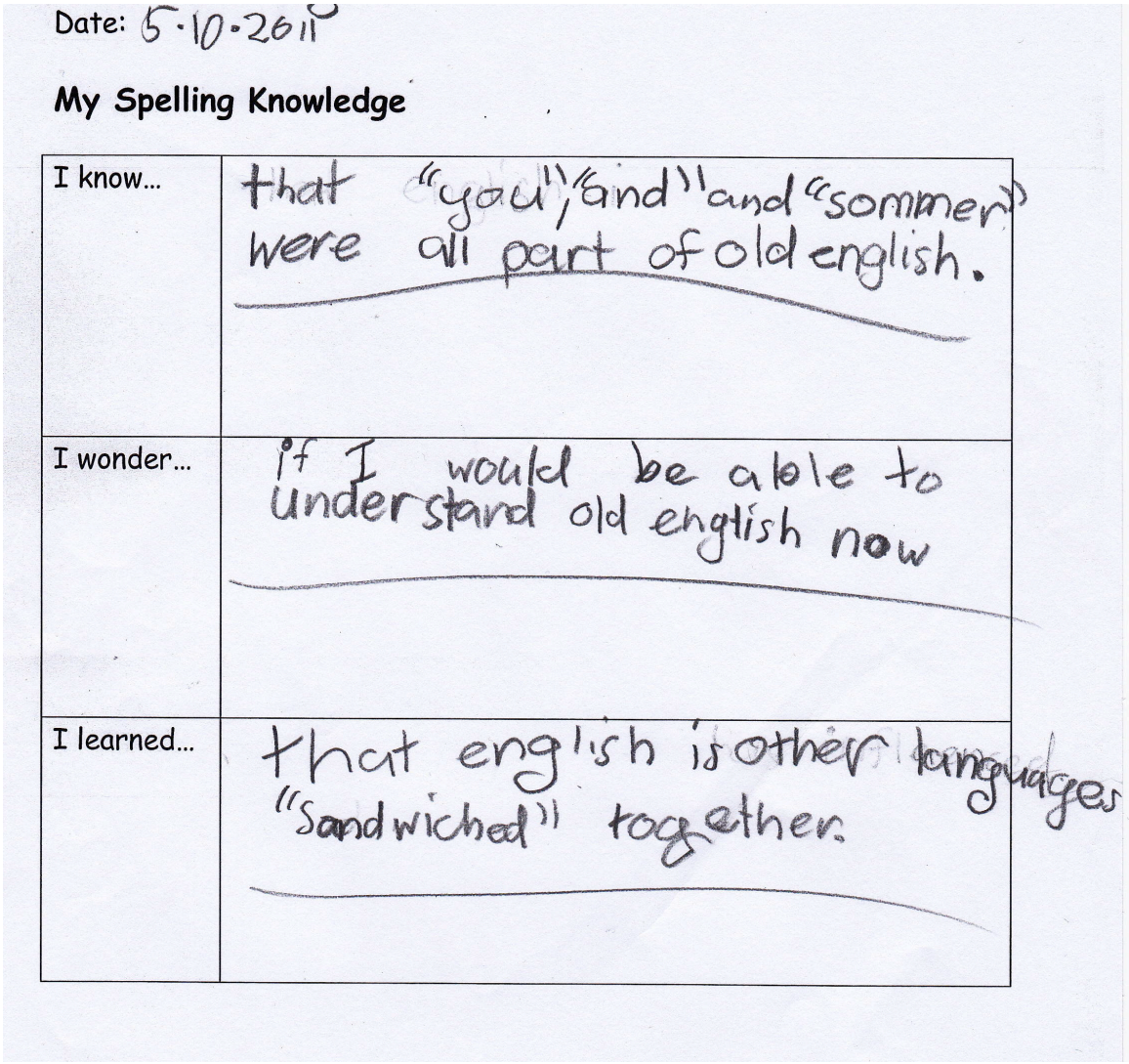
Directions:

- Add the correct endings to the word
- Remember to add an extra consonant to words with short vowels

1. Add -y to **slop** Sloppy
2. Add -y to **flab** flaby
3. Add -y to **price** pricy
4. Add -y to **icy** icey / icy
5. Add -y to **hazy** hazy / haze

Base words

Appendix I: Student example of Know, Wonder Learn exit task



Date: 5-10-2011

My Spelling Knowledge

I know...	that "goul", "and" and "sommer" were all part of old english.
I wonder...	if I would be able to understand old english now
I learned...	that english is other languages "sandwiched" together.

Appendix J: Ten-day weekly session overview plus example lesson plan for whole group including worksheets

Ten-Day Weekly Session Overview

Day 1	Day 2	Day 3	Day 4	Day 5
Assessments	*Word Origin*: Students will briefly learn where words come from and how that affects their spelling. **Activity:** Students will work in groups to complete a poster about the country they have been assigned. **Spelling** **WALT**: to explore where words come from and how that affects spelling.	*Word Origin Continued:* Students will continue exploring about the origin of words. **Activity:** Students will finish posters from the previous week and present them to the group. Student will play language invasion game. **Spelling** **WALT**: to explore where words come from and how that affects spelling.	*Word Origins +Introduction to Spelling Patterns:* Students will continue to explore the foundations of the English Language and explore different spelling patterns. **Activity:** Table Work including word sorts for long and short vowels, world exploration sheets and shared writing. Each group shares their "shared writing" with the class. Short writing session **WALT**: *explore the relationship between long and short vowels and spelling patterns. *explore the origin of words	*Spelling Patterns and their relation to word origin:* Students will identify different word endings and beginnings that sound similar (focusing on French origins of words). **Activity:** Students will sort words according to similar patterns and sounds *E.g.: sh/ soft ch/ hard ch; ck/k_e/-que; hard g/soft ge short vowel/soft ge long vowel* **Spelling** **WALT**: explore, identify and sort English words with French origins
Day 6	Day 7	Day 8	Day 9	Day 10

Spelling Patterns and their relation to word origin continued: Students will identify different word endings and beginnings that sound similar (focusing on French origins of words). **Activity:** Students will complete word sorts and make the correct changes. Students will gather around at the end and identify new learnings as a group. Students will complete 5 minute silent writing. *Extension: Students who complete word sorts correctly will look for similar words within their own reading texts.* **WALT:** *explore, identify and	*Spelling Patterns within our reading and writing:* Students will explore their frequent errors in Spelling in groups. **Activity:** Using writing passages from previous week identify frequent spelling pattern errors students are making, brief overview of specific patterns, in groups students do activities in groups that are centred around these patterns. Identify generalisations about these patterns as a group. (think about using word sorts for these) Short writing activity. Review new learnings as a group. **WALT**: practise specific spelling patterns and	*Spelling Patterns within our reading and writing continued:* Students will explore their frequent errors in Spelling in groups. **Activity:** Using writing passages from previous week identify frequent spelling pattern errors students are making, brief overview of specific patterns, in groups students do activities in groups that are centred around these patterns. Identify generalisations about these patterns as a group. (think about using word sorts for these) Short writing activity. Review new learnings as a group.	*Spelling Rule Review and Bingo:* Students will practise review learned spelling patterns. **Activity:** *Spelling Pattern and Learning review - students come up with Spelling Patterns that they have discovered/practised as a group. *Spelling Bingo **WALT:** identify, explore and explain spelling patterns and word origins.	*Assessments*

sort English words with French origins *identify specific patterns in words	making generalisations about them	*NOTE: may need to change activities and groups depending on students' needs*. **WALT**: practise specific spelling patterns and making generalisations about them		

Example Lesson Plan for Whole Group

Whole Group Lesson Plan 3 (Day 4): Word Origins +Introduction to Spelling Patterns

Materials Needed: Power point presentation, Long and short vowel word sorts, paper and pencils for writing, Where in the World work sheets, Group Story work sheet

Overview: Students will continue to explore the foundations of the English Language and explore different spelling patterns.

WALT: We are learning to explore the relationship between long and short vowels and spelling patterns.
We are learning to explore the origin of words.

Assessment: Monitoring student understanding with thumbs up or down, completed KWL sheet

Accommodations: Need to make sure that certain students have the support they need from teacher (aka one on one direction for LO and JM). Use direct instruction to model the inquiry/exploration process for students who are visual learners

Time	Teacher Behaviour	Student Behaviour
5-8 Minutes	***Quick Review:*** Review from week before with our Spelling Knowledge List (Powerpoint) *What we wonder about Spelling *What we've learned	Students listen attentively and add in extra thoughts.
5-8	**Explanation of Activity** Students work in Assigned groups on the various activities that are around the room *Explain each activity (word sorts for long and short vowels, world exploration sheets, shared writing)	
30-40 min (10min/area)	**Activity** Students work in groups on their posters with their group. Teacher walks around and	Students work with their peers

	assists students, encourages them to make discoveries with their peers	
10min	**Sharing/Coming Together** Bring students together and share the writing the students came up with.	Group listens attentively
Closing 3-5	Give students Know, Wonder Learn sheet.	Students fill in KWL sheet
If time… 10 min	Writing session	Students write independently and silently for 10 min.

Corresponding Worksheets for above Lesson Plan

Long and Short Vowel Word Sort (two handouts: word sort plus sorting list with accompanying questions)

Long Vowels	Short Vowels

Words for Sorting

Catch Eat Jump Teach Run Tray Flat

Peach Huge Mix Pan Batch Patch

Cake Ice Back Make Pop Mop Wrap

Old Cute Back Fact Tack Take

Peach Jump Nice Like Run Fox

Price Happy Pale Life Shine Smile Seed

Say Pay Pile Stripe Feed Sweet

Questions:

* Find as many patterns as you can with these words. List them below.

*What other words have long or short vowels in them?

* Make Sentences using these words. Write them on a blank piece of paper.

Where in the World Work Sheet (one handout plus accompanying answer key)

Where in the World? Word Exploration Sheet			
Word	What I think it means…	The dictionary definition is…	Where is the word from? (Old English, French, Latin or Greek)
Cycle			
Aquarium			
Photograph			

Chandelier			
Courage			
Hundred			
Summer			
Dictionary			
Queen			

Where in the World
Word Exploration Sheet Answer Key

Word	**What I think it means…**	**The dictionary definition is…**	**Where is the word from? (Old English, French, Latin or Greek)**
Cycle			Greek
Aquarium			Latin
Photograph			Greek
Chandelier			French
Courage			French
Hundred			Old English
Summer			Old English
Dictionary			Latin
Queen			Old English/French

Group Story Work Sheet (one handout)

Group Story

Group Members:

Directions:

*Working with the Whole Group.

*Write a story with your group about the history of the English Language.

*It needs to include:

- 1 fact about the history of the English language
- Any other details you would like to include (these can be pretend)
- Every person from your group MUST write at least 1 sentence.

*Rotate through in a circle.

*Use the back of the sheet if your story is too long.